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Essays on the Behavioral Effects of Tax Policy

John Allen Deskins
University of Tennessee - Knoxville

To the Graduate Council:

I am submitting herewith a dissertation written by John Allen Deskins entitled "Essays on the Behavioral Effects of Tax Policy." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Economics.

William F. Fox, Major Professor

We have read this dissertation and recommend its acceptance:

Kenneth Anderson, Donald Bruce, Michael McKee, Matthew Murray

Accepted for the Council:
Dixie L. Thompson

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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Graduate Studies

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Essays on the Behavioral Effects of Tax Policy

A Dissertation
Presented for the
Doctor of Philosophy Degree
The University of Tennessee, Knoxville

John Allen Deskins
May 2005

Dedicated to the lives of
John Walter Deskins and Elmer Stiltner
for their virtue and for the
way in which they shaped my life.

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Abstract

Provided herein is policy relevant empirical evidence on the effects of tax policy on three different areas of behavior: business tax planning, entrepreneurship, and personal income tax compliance. A study of business tax planning is meritorious in light of the recent erosion of state corporate income tax bases and the corresponding search for solutions. The effect of tax policy on entrepreneurship is especially important given the attention that policymakers devote to development policies and the potential social benefits that entrepreneurship can generate. A consideration of income tax compliance behavior among self-employed individuals is warranted due to the costly distortions that could arise from asymmetric tax compliance patterns across groups.

Essay 1

The focus of the first essay is on the extent to which business tax planning in response to variations in state tax policy has affected state corporate income tax bases and revenues. Tax planning is defined as a broad set of actions undertaken by firms to reduce their tax liability. Financial or accounting tax planning is contrasted with what is referred to herein as locational distortions, in which firms move physical operations to avoid higher tax liabilities. Results from a fixed effects instrumental variables regression model using a 1985-2001 panel of state-level data provide highly suggestive evidence that tax planning activity significantly diminishes taxable corporate profits in high tax states. Specifically, results indicate that state corporate income tax bases decline by around seven percent following a one-percentage-point increase in top marginal corporate income tax rate, controlling for locational distortions. Results also suggest that throwback rules are usually ineffective in restoring corporate income tax bases while combined reporting requirements are often effective. Further analysis indicates that tax planning has not diminished the locational distortions of tax policy.

Essay 2

In Essay 2, a 1989-2001 panel of state-level data is used to examine the influence of state tax policies on entrepreneurial activity. Entrepreneurship is defined specifically as self-employment. Fixed effects regression results indicate that marginal tax rates for corporate income, personal income and sales taxes do not have statistically significant impacts on state entrepreneurship rates or state shares of the national entrepreneurial stock. However, other key aspects of state tax policies such as combined reporting requirements, LLC provisions, and personal income tax progressivity are found to be important determinants of the observed level of entrepreneurial activity in many cases.

Essay 3

In the final essay, experimental methods are used to better understand personal income tax compliance when a portion of an individual's income is relatively difficult to detect upon audit by the tax authority. This is motivated by the likelihood that individuals whose income is not reported by a third party, the self-employed for example, may be less likely to be found evading taxes relative to scenarios where there is third party reporting. Experimental methods provide several advantages for examining this issue. Most importantly, an appropriately designed experiment will allow for a better isolation and control of the fundamental influences arising from variations in income matching policy across modes of employment, relative to naturally occurring data. Results indicate that tax compliance rates decline as individuals earn larger shares of income that is not perfectly detectable. Results also indicate that tax compliance rates decline with higher income, lower audit rates, and higher tax rates.

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Part 1

General Introduction

Seeking to understand how taxes affect behavior has long been a major component of the agenda of public economists. It is imperative that policymakers are aware of and fully understand all potential consequences associated with proposed tax policy changes, both intended and unintended. This necessity requires that reliable information concerning the existence and magnitude of various effects surrounding tax policy be provided. This is especially true given that tax policies sometimes have large effects on a variable of interest but often have little or no effect. A tax policy may retard efficiency if it attempts to encourage a socially desirable action but does not have a significant effect in practice. On the other hand, tax policy could lead to significant efficiency gains if designed optimally. Furthermore, many tax policies have ambiguous theoretical effects and thus require empirical testing.

In this vein, this dissertation seeks to provide examinations surrounding three different but related areas of tax policy: business taxation, entrepreneurship, and personal income tax compliance. The dissertation is divided into three distinct essays, which are presented separately below. Each essay is an empirical assessment of a different area of tax policy and exploits different data and methodology. The essays explore, more specifically, (1) how tax planning activity in response to variations in state tax policy affects state corporate income tax bases and revenues, (2) how state tax policy affects entrepreneurship, and (3) how tax policy relating to income reporting affects personal income tax compliance. This research is intended to aid policymakers in judging the appropriateness of existing tax policies as well as in designing future policy changes.

Part 2

Essay One:

On the Extent, Growth, and Efficiency Consequences of State Business Tax Planning

1.A Introduction

Traditionally, much of the literature on state corporate taxation has focused on how taxes affect the location of economic activity (see Wasylenko, 1997). A perpetual concern among policymakers is that higher tax rates or broader tax bases will retard business development in a geographical region. In contrast, some recent research has begun to focus more on tax planning, or how firms expand after-tax profits by adjusting to tax policy through financial arrangements within related firms. Interest in tax planning among businesses is evidenced by the fact that each of the Big Four accounting firms and many banks maintain specific groups to deal exclusively with aiding firms in making optimal tax arrangements.

Tax planning is defined here as a broad set of tax avoidance and evasion schemes that affect only financial arrangements of firms. Tax planning is contrasted with strategies in which firms move physical operations to avoid higher taxes – herein termed locational distortions of tax policy.[1] Tax planning exploits differences in state tax policies and often involves sophisticated arrangements wherein firms create one or more subsidiaries for the purpose of shifting income from high to lower tax jurisdictions. Tax planning strategies are often legal, but some may fall into a legally gray area or even be blatantly illegal methods of tax evasion such as underreporting of taxable income or overstating tax deductions.[2]

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[1] Note that locational distortions need not be restricted the movement of an entire firm. Indeed, many locational distortions may involve marginal changes in economic activity. For example, consider a firm that has unused capacity in two states, A and B. Locational distortions include a case in which said firm chooses, for tax purposes, to direct a production increase to the excess capacity in state A rather than to state B.

[2] An aggregation of tax avoidance, tax evasion, and ambiguous practices differs from traditional analysis but is consistent with recent research. See Slemrod (2004) who refers to these actions as "tax

Policymakers' uneasiness surrounding increases in the use of more effective tax planning techniques is grounded in their potential contribution to the decline of state corporate income tax bases. State corporate income tax revenues as a share of corporate profits have fallen by about one-third from 1989 to 2002 (controlling for rate changes), and research has asserted that tax planning is a predominant contributor to this decline (Fox and Luna, 2002).[3] Some policymakers are unsure as to the source of future government funding if this tax base erosion continues. Their concern is evidenced by the fact that, since 2002, as many as 18 states have considered adding or modifying a combined reporting requirement with the intention of retarding tax planning activities (Houghton, Hogroian, and Weinreb, 2004). Other potential concerns include issues of neutrality when only a subset of firms is able to use tax planning to minimize taxes and increases in compliance and administrative costs associated with implementing tax planning practices.

The efficiency consequences of tax planning cannot be determined *a priori*. For example, suppose tax planning enables firms to achieve the desired level of tax avoidance/evasion with purely financial arrangements. If these arrangements replace the locational distortions of tax policy, many of the efficiency losses brought about by business taxes could be alleviated. In other words, prior to the adoption of tax planning strategies, firms may have moved real activity in response to tax policy, creating an inefficient allocation of resources. Tax planning strategies may allow

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selfishness." One advantage of this aggregation is the ability to avoid categorizing legally ambiguous practices along the grey area between evasion and avoidance.

[3] Other likely determinants of the tax base erosion are reductions in the federal corporate income tax base (to which essentially every state CIT base is coupled) and state concessions for economic development purposes.

firms to respond to tax policy through structural changes within the firm, removing the inefficiency from repositioning operations. Some also would assert that tax planning can be efficiency-enhancing when viewed within a Leviathan framework (i.e., it helps to constrain a government that is too large). On the other hand, tax planning may retard efficiency if it ignites a "race to the bottom" that yields tax rates on mobile capital below an efficient level, resulting in an economy that is too capital intensive (Inman and Rubinfeld, 1996). Further, overall efficiency changes depend on several other factors such as administrative and compliance costs (which could potentially be very large) and, in a revenue neutral framework, on the alternative revenue sources used to replace declining corporate tax revenues.

The degree to which tax planning activities have eroded state tax bases is yet to be empirically tested with a significant degree of rigor. It remains to be seen whether anecdotal accounts of tax planning cases are few and isolated or whether tax planning activity has significantly reduced tax revenues. Indeed, as evidenced by the Associated Industries of Massachusetts (2004), a consensus regarding the extent of tax planning is elusive. Fully informed tax policy decision making relating to the modification of business taxes (and a thorough understanding of state tax revenue trends) requires more precise information as to the effects of tax planning.

The purpose of this essay is to determine the extent to which tax planning activity in response to state tax policy differences among U.S. states has lowered state corporate income tax revenues. This effect cannot be measured directly but will be accomplished indirectly by examining relationships between several state tax policy parameters and state corporate income tax bases. More specifically, evidence of the

impact of tax planning can be inferred from an econometric model that examines the effects of tax structure variables on the corporate income tax base while holding state economic activity constant. This study also assesses how the degree to which the effect of such activities on corporate income tax bases has changed over time. Further, the processes used below question whether some of the methods designed to restore corporate income tax bases (i.e., combined reporting requirements and throwback rules) are effective.

This study proceeds as follows. Section 1.B provides a review of the relevant literature. Section 1.C presents a more in-depth discussion of several tax planning strategies. Section 1.D details the empirical strategy and the data that are used. Section 1.E presents a discussion of the results, and Section 1.F concludes. Results indicate that tax planning in response to state tax policy differences significantly diminishes state corporate income tax bases in higher tax states. In addition, evidence suggests that combined reporting requirements are frequently effective in partially restoring state corporate income tax bases while throwback rules often are not. Results do not indicate that tax planning has diminished the locational distortions of tax policy between 1985 and 2001.

1.B Existing Literature

No studies have been identified that specifically measure the extent to which tax planning has eroded state tax bases. Fox and Luna (2002) review state corporate income tax revenue trends and assert that tax planning is a contributor to the decline of state corporate bases. They also discuss some of the methods that are intended to

restore corporate income tax base erosion due to tax planning (some of which are discussed below). However, they do not specifically measure the effect of tax planning on state tax bases.[4]

Two other areas of literature are of relevance to this study. The first is the literature on the locational effects of tax policy, or how tax policy affects the location of the physical operations of firms. This large literature represents, in large part, the traditional treatment of the effects of tax policy on business. This area is important to this study because, (1) as previously stated, it may be possible that tax planning activity has affected locational distortions and (2) the methods below provide further information as to the effects of tax policy on the location of economic activity. The second area of relevance is the literature that deals with tax planning in response to federal tax policy, which has likely grown significantly over the past decade or so.[5] Tax planning at the federal level is relevant because it directly affects state tax bases since nearly all states begin their definition of profits with the federal definition. In addition, the degree to which firms pursue tax planning around federal policy may signal the intensity of planning at the state level.

Locational Effects of Tax Policy.

The literature on the effects of tax policy on the location of economic activity is vast, in part due to the great emphasis policymakers place on structuring tax policy to be conducive to economic development. Fortunately, this literature is summarized

[4] Also see Mazerov (2003) and Schiller (2002).
[5] See Bankman (1999) for example.

by Wasylenko (1997), who reviewed over 75 studies.[6] What follows is a brief overview of his review. A portion of the methodology below aligns with the standards of this literature.

Wasylenko begins with a review of issues associated with the design and estimation of economic development as a function of tax policy. Most studies are designed to represent a profit or cost function that determines the profitability of locating in a particular region. The most common measures used to capture economic activity are employment, income, investment, or business location. Explanatory variables usually include measures of input costs, such as wages and energy prices; measures of market size, such as population, median income, or unionization; and various measures of tax policy. The most common tax policy measures are statutory tax rates and tax revenues relative to some measure of income or population. Most studies fail to incorporate more detailed elements of tax structures such as incentives for economic development.

According to Wasylenko, the general conclusion of the literature on the interregional effects of tax policy is that tax policy is a statistically significant determinant of economic activity. However, the magnitudes (and even direction) of the effects of tax policy on economic development are scattered. The tax elasticity estimates that Wasylenko reports range from a fairly large –1.54 to 0.54 depending primarily on data used for the dependent variable (particularly micro- versus aggregate-level data), methodology, and time period of analysis. However, the median tax elasticity in each of the dependent variable categories is negative and is

[6] See also Bartik (1991 and 1994).

generally small. For example, studies that specify gross state product as the dependent variable (most relevant to the current study as discussed below) report a median tax elasticity of –0.07. That is, given a one percent in some tax parameter, gross state product declines by only 0.07 percent.

Federal Tax Planning

Concern over tax planning is evidenced at the federal level by the U.S. Department of the Treasury (1999). This study expresses a significant concern over the use of corporate tax sheltering (similar to the tax planning definition used here) and represents an attempt to design better strategies to combat such practices. The study cites several reasons to be concerned about tax sheltering such as revenue losses, disrespect for the tax system, increased complexity, and the cost to firms of pursuing such activities. The Internal Revenue Service (2003) estimated that losses from abusive tax shelters amounted to $14.5 to $18.4 billion in 1998. Compared to corporate income tax receipts of $204.2 billion, the loss from sheltering amounts to between 7 and 9 percent of corporate revenues. Following Slemrod (2004), if the average of this span is added to a recent estimate of corporate tax evasion of $53.0 billion (U.S. General Accounting Office, 1998), abusive tax sheltering combined with evasion amounted to 26.1 percent of corporate tax receipts in 1998.[7]

A few studies have examined more closely the causes of corporate tax sheltering and the policies with which it is most closely associated. Desai (2002)

[7] See Mackie (2000) for a discussion of the problems of using average tax rates to examine the effects of tax sheltering.

studies federal tax sheltering by using simulations to examine the growing divergence between corporate book income and taxable income. He finds that over half of the difference between book and taxable income in 1998 is due to differences in the treatment of depreciation, the reporting of foreign source income, and the shift from the use of salaries to compensate employees to the use of stock options. Desai also finds evidence that the relationship between book and tax income has become much less stable over the past few years, indicating increasing tax sheltering activity. Desai and Dharmapala (2004) develop and test a model that explains how incentive compensation for management relates to the degree to which firms pursue tax sheltering strategies. Although their theoretical model yields ambiguous results, their empirical findings indicate that increases in incentive compensation lead to less tax sheltering activity. Rego (2003) finds that economies of scale exist in tax planning, i.e., larger and more profitable multinational firms are better able to reduce their income tax liability through tax planning.

A highly publicized form of tax planning at the federal level involves corporate inversions, or when a corporation with a foreign subsidiary (usually in a low or no tax country) inverts its structure such that the foreign subsidiary becomes the parent company and the U.S. firm becomes the subsidiary. This tactic generally allows the corporation to reduce its tax liability on its foreign income and also to hold pre-tax profits until earnings are repatriated to the U.S. Desai and Hines (2002) analyze the determinants of inversions and find that firms that are largest, those with more overseas assets, those that are more heavily leveraged, and those that operate in low-tax foreign countries are most likely to invert.

Gentry and Hubbard (1998, p.193) discuss three general forms of tax planning encouraged under the current federal corporate income tax: "discouraging incorporation, encouraging borrowing, and altering the timing of transactions." They analyze how fundamental tax reform in the form of either (1) integrating the personal and corporate systems or (2) moving from the current income tax to a pure consumption tax would alleviate these tax planning incentives. They conclude that both types of reforms can significantly reduce the incentives to adopt these forms of tax planning.[8]

1.C How Does State Tax Planning Work?

Firms employ numerous tax planning strategies to reduce their tax burden. An exhaustive review is impossible because known strategies are numerous and many strategies are likely unknown to tax analysts. Luna (2004) provides an excellent discussion of some of the most important tax planning techniques and offers several remedies that could curb tax planning activities. Her discussion identifies six major categories of tax planning:

(1) Exploiting differences in state corporate income tax apportionment formulas,

(2) Altering the distinction between business and non-business income,

(3) Exploiting differences in corporate income tax nexus standards,

(4) Using transfer pricing from high tax to low tax jurisdictions,

[8] See Hines (2002) for a discussion of how governments respond to the adoption of tax avoidance strategies.

(5) Employing passive investment companies, and

(6) Using the limited liability company (LLC) form.

Exploiting changes in the apportionment formula for state corporate income taxes can lead to significant tax reductions. The apportionment formula for the state corporate income tax uses a corporation's state share of its national property, plant, and payroll to apportion the corporation's national profits to the states for tax purposes. It has been commonly used as an instrument to attract production. Increasing the sales factor weight presumably will entice firms, especially manufacturing firms, to expand production in a given state. In general, for given tax rates locating manufacturing operations in a state with a high sales factor weight while selling in many states will reduce tax liability compared to positioning manufacturing in a state with a low sales factor weight and higher weights on property and payroll factors (see Edmiston, 2002). Indeed, only 12 states applied an equal weight to all factors in 2004, while 23 states double-weighted the sales factor, and the remainder applied more than a 50 percent weight to sales.[9]

Many firms have altered the mix of business and non-business income to reduce tax liability. This distinction is important because only business income is apportionable while non-business income is allocated to the state in which it was earned. Therefore, a firm can reduce its tax liability when it is able to classify some income as non-business and shift it to a low or no-tax state.

[9] A significant amount of this variation occurred during the time period of this analysis. Indeed, 24 states increased their sales factor weight at least once during this time period.

A common type of tax planning that can significantly affect tax liability is transfer pricing. For example, consider a firm that is headquartered in Delaware and has two wholly owned subsidiaries, a retailer in Montana and a wholesaler in Wyoming. An increase in the price that the Wyoming firm charges the Montana firm shifts profits from Montana to Wyoming. This transaction will lower overall tax liability as long as Wyoming's tax rate is lower than Montana's (Wyoming does not impose a corporate income tax), and Montana does not impose a combined reporting requirement.

The fifth group of tax planning practices involves the creation of a passive investment company. This strategy often exploits the tax structure of either Nevada, which does not tax corporations, or Delaware, which does not tax income from intangible assets, but can be effective in other circumstances as well. Perhaps the most famous case is with Toys Я Us and its subsidiary Geoffrey, Inc (Geoffrey, Inc. v. South Carolina tax Commission, 114 S. Ct. 50 (1993)). Toys Я Us created Geoffrey, Inc. in Delaware to house the Toys Я Us trademark. Geoffrey, Inc. only had physical presence in Delaware. Toys Я Us stores across the states pay royalties to Geoffrey, Inc. and transfer income to Delaware, effectively eliminating the income from state tax bases. Numerous corporations have duplicated this practice.

Lastly, limited liability companies (LLCs) allow enhanced tax planning opportunities for large firms and, in doing so, have likely contributed to the fall of state corporate income tax bases (see Fox and Luna, 2004). Most states began allowing for the creation of LLCs in the early 1990s, and all states had done so by the end of 1997. The simplest way for a large corporation to use LLCs to avoid taxes is

to create a single member LLC to house its operating company for a particular state and to own this LLC with a Delaware corporation that does not otherwise have nexus in the state. Delaware does not tax a firm that only administers an intangible investment, and LLC interest is considered an intangible. This arrangement effectively removes all of the operating firm's profits from state taxation unless the state where the LLC is located imposes an entity level tax on LLCs.

1.D Empirical Design and Data

The primary hypothesis in this study is that cross-state differences in corporate tax policies have led to tax planning activity that has significantly lowered state corporate income tax bases. The effect of tax planning on tax bases cannot be measured directly but can be tested in the following way. The state corporate income tax (CIT) base is determined by three factors: (1) a set of state determined institutional parameters that define taxable income, (2) the magnitude of economic activity in the state that is taxed under the CIT structure, and (3) the ability of firms to make financial or accounting adjustments to lower their tax liability. The third determinant of the CIT base is tax planning – the myriad ways in which firms adjust and restructure to lower tax liabilities. Tax planning reduces the base when firms use financial arrangements to move profits to low or no-tax states or when they evade taxes, but without moving real activity. Tax planning activity to reduce taxable

corporate profits may be spurred by a change in any policy that raises the effective overall tax rate that firms face or by an effective tax differential between states.[10]

Within this framework, it is imperative to understand how a policy may affect the CIT base in a complex fashion - through more than one of these three determinants. Consider a change in a given tax policy that raises the effective tax rate for firms or their owners. A change in the CIT rate is an obvious example. A higher CIT rate may affect the CIT base through two paths: locational effects and tax planning. Locational effects lower the tax base when firms physically move activities to avoid high tax liabilities. This channel operates through economic activity in the above framework, i.e., when firms leave a state, economic activity declines, lowering the tax base. Also, a higher CIT rate could cause firms to establish financial arrangements to reduce their tax liability without moving physical operations (or affecting economic activity in the state). [11] That is, an effective tax rate change could affect the CIT base directly through a second channel, tax planning.

To clearly understand the effect of tax planning activity on the CIT base, it is necessary to separate any locational distortions from the effects of tax planning. Examination of the effect of tax planning on state CIT bases is accomplished here by

[10] The set of government determined institutional parameters includes policies such as CIT apportionment formulas, combined reporting requirements, LLC provisions and tax incentive programs. The set of variables that may affect the extent of tax planning activity includes any policy that changes the overall effective tax rate firms face, including tax rates as well as other parameters, many of which are the same variables that define the CIT base.

[11] Of course, other effects muddle this picture and render the relationship between higher tax structures and tax planning theoretically ambiguous. See Crocker and Slemrod (2004) and Slemrod (2004) for recent models of corporate income tax evasion.

estimating a regression model that explains state CIT bases. Working in the above framework, the first set of explanatory variables in the model is a set of government issued parameters that define the CIT base. Included second is Gross State Product (GSP), used to measure economic activity. The third set of variables includes factors that change the effective tax rate that firms face, one of which is the CIT rate. Consider the interpretation of the coefficient estimates of this last group of variables on the CIT base, keeping in mind that they may affect the CIT base through either tax planning or locational distortions. The key is that including GSP in this model holds economic activity constant and thereby accounts for the linkage between tax structures and tax bases through locational distortions. This technique isolates the effects of the tax structure on the tax base through tax planning. Therefore, any remaining statistically significant effect of these variables can be attributed only to tax planning.

A foremost econometric issue in this context is the potential endogeneity of GSP in explaining the CIT base. That is, not only does the CIT base follow from state economic activity but also from changes in the CIT base could affect state economic activity. Therefore, it is necessary to use a two-stage instrumental variables regression model that estimates GSP in the first stage and CIT base in the second stage. Of course, this model requires at least one instrumental variable in the GSP equation that does not have an independent effect on the CIT base. Technical details are discussed below.

A second hypothesis is that tax planning activity has begun to substitute for the locational distortions of tax policy. More specifically, firms may be increasingly

able to avoid higher taxes simply by engaging in tax planning strategies rather than actually moving physical operations to lower tax jurisdictions. This hypothesis can be tested by examining how the effect of the CIT rate on both its base (holding GSP constant) and on GSP differs over time. This approach is accomplished in the regression framework discussed by including an interaction between the CIT rate and a time variable. If tax planning activity is rising and if tax planning and locational responses are substitutes, the CIT rate (and other tax policy instruments) would be of waning importance over time in determining state economic activity. This effect happens if firms are increasingly able to exploit beneficial (or avoid harmful) tax policies through tax planning mechanisms instead of through changes in business location. The CIT rate would also have a growing effect on its base over time if tax planning were becoming more prevalent.

Econometric Methodology

A two-stage regression model is used to investigate corporate income tax planning. The analysis employs a panel of data from all 50 U.S. states for years 1985 through 2001. The primary regression explains state corporate income tax bases as a function of three factors: (1) state economic activity, (2) several parameters that describe CIT structures, and (3) other tax variables that may induce firms to lower taxable profits with tax planning strategies. The primary stage of the regression model is summarized below:

$$\text{CIT Base}_{i,t} = \beta_0 + \beta_1 \text{CIT Rate}_{i,t} + \beta_2 \text{PIT Rate}_{i,t} + \beta_3 \text{Sales Rate}_{i,t} + \beta_4 \text{Sales Factor Apportionment}_{i,t} + \beta_5 \text{Combined Reporting}_{i,t} + \beta_6 \text{LLC}_{i,t,} + \beta_7 \text{Throwback Rule}_{i,t} + \beta_8 \text{Tax Incentives}_{i,t} + \beta_9 \text{Non-Tax Incentives}_{i,t} + \beta_{10} \text{GSP}_{i,t} + \varepsilon_{it},$$

where *i* and *t* are state and year indices. Technical details are discussed below.

Economic Activity and Corporate Income Tax Base Measures. Non-government gross state product (GSP) is used to measure economic activity. Government production is excluded because it is potentially not subject to corporate taxation.

The corporate income tax base is approximated by dividing corporate income tax collections by the highest marginal state corporate income tax rate for those states with a corporate income tax.[12] This method suffers from measurement error given that a few states have progressive corporate income tax schedules. However, the consequences of this error are likely to be minor for two reasons. First, the majority of states (31 out of 44 that taxed corporate income in 2001) have a single rate. Second, in the remaining 13 states that have progressive corporate income tax schedules, the threshold for the top bracket is relatively low such that the majority of income falls into the top bracket. The corporate income tax base is estimated for the six states without a corporate income tax by regressing a measure of the federal corporate income tax base by state (Internal Revenue Service, various years) on state CIT bases using only data for states with a CIT. The parameter estimates from this

[12] Nevada and Wyoming have no broad business tax. Michigan imposes a single business tax (sometimes described as a business activities tax or value added tax). Texas imposes a franchise tax on earned surplus. South Dakota imposes a corporate income tax on banks. Washington imposes a gross receipts tax termed the business and occupations tax. (Federation of Tax Administrators, 2004) Michigan, Texas, South Dakota, and Washington are treated as if they have no CIT whatsoever.

model are then applied to obtain predicted values for CIT bases for states without CITs.[13]

Tax Rates. The top marginal CIT rate is often the focal point of public attention surrounding business taxation. In addition to locational distortions, higher tax rates might justify the adoption of costlier and more effective tax planning techniques to lower taxable profits. The omission of the CIT rates of lower brackets leads to measurement error, but the error is relatively unimportant for the same reasons offered above in the context of using the top marginal rate in calculating corporate income tax bases.

As previously stated, any tax parameter that affects the overall tax burden firms face could encourage tax planning activity to offset higher overall taxes, not just parameters directly related to the corporate income tax. The state general sales tax rate is included because it likely represents the largest component of the overall state tax liability of many firms since it is imposed on the sales value of many business-to-business transactions (Cline et al., 2003a and 2003b; Cline et al., 2005). Of course higher sales tax liabilities could have locational effects in the traditional sense. In addition, as firms are faced with higher sales tax burdens, they may be induced to use tax planning strategies to avoid the sales tax or other taxes, some of which could be reflected in the CIT base. In a similar fashion, the top marginal personal income tax (PIT) rate is included. Firms may adopt planning strategies to reduce other taxes (i.e., the corporate income tax) when PIT rates rise because owners are taxed under the PIT

[13] This procedure uses a random effects regression that results in an overall R-squared of 0.72. The federal corporate income tax base coefficient is statistically different from zero at the one percent level. Results are omitted for brevity but are available upon request.

when corporations pay dividends. Alternatively, firms may be more likely to incorporate when faced with higher PIT rates relative to CIT rates, and if so, higher PIT rates could actually raise the CIT base.[14]

Corporate Tax Structure. Elements of the corporate tax structure could influence GSP and also have independent effects on CIT bases. The former is true because many of these parameters raise or lower effective corporate tax rates, which may create locational distortions. The independent effects on CIT bases may occur because these variables help define the CIT base. The first variable included in this group is the sales factor weight in the state corporate income tax apportionment formula. As previously stated, the apportionment formula for the CIT is a commonly used instrument for attracting production. The sales factor weight can affect GSP if it encourages firms to relocate to a given state (see Edmiston, 2002).

Combined reporting requirements can be an important element of state CIT structures as they may be able to preclude some tax planning strategies based on transfer pricing, such as the use of passive investment companies. Combined reporting requires firms that are part of a unitary group to file a single corporate income tax return. This arrangement ignores the individual corporations in the same group and eliminates the effects of intra-group transactions. Although combined reporting can restore tax bases by eliminating tax planning strategies, it is not a perfect instrument (see Fox and Luna, 2002, for a discussion). Combined reporting requirements could reduce economic activity in a state by driving away firms if such

[14] There is a significant amount of variation in CIT, PIT, and sales tax rates, both between states and within states, during the timeframe of this analysis. For each of these taxes, over half of states changed the rate at least one time from 1985 to 2001.

requirements effectively raise the CIT burden by disallowing some planning opportunities.[15] Fourteen states imposed combined reporting requirements in 2001 (five of those 14 states added the requirement during the timeframe of this analysis). Combined reporting is specified as a dummy variable to denote whether a state requires combined reporting.[16]

In a similar vein, a dummy variable to denote whether a state has a throwback rule is included. Policymakers commonly use this rule in attempts to restore the CIT base. Slightly over half of corporate income taxing states (24 out of 44) imposed a throwback rule in 2001 (six states either added or removed this rule during the timeframe of this analysis). If a throwback rule is imposed in state A, a corporation that is headquartered in state A must pay taxes to that state on any income earned from sales in states where that corporation does not have CIT nexus. Thus, a throwback rule is intended to eliminate "nowhere income."[17] In doing so, it reduces the effectiveness of tax planning strategies that attempt to shift income to states where corporations do not have nexus. A throwback rule could create locational distortions because it raises CIT liabilities.

State legislation permitting limited liability companies (LLCs) can create tax planning opportunities and may affect economic activity across states (see Fox and Luna, 2004). The option for LLC status could have affected economic activity

[15] On the other hand, firms can locate passive investment companies in combined reporting states to undertake tax planning for separate reporting states. For example, California is a frequent situs for passive investment companies.
[16] Also see McIntyre, Mines, and Pomp (2001).
[17] Nowhere income possibilities were created by PL 86-272, which prevents a state from imposing a tax on firms whose only relationship with the state is solicitation of orders for tangible personal property.

because firms may have started in or relocated to states to exploit this organizational form. The LLC structure can be preferred over the C-corporation structure because LLCs also offer limited liability, but in many cases they are treated as pass-through entities with the income taxed only under the PIT system.[18] Further, LLCs are often exempt from some other corporate taxes, such as the corporate license taxes in Kentucky and Louisiana. This arrangement allows these firms to avoid double taxation of the CIT and PIT systems, reducing CIT bases. In addition, LLC allowances could erode CIT bases through the tax planning opportunities they allow. This variable is specified as a dummy to denote whether states permit LLCs.

Economic development incentive programs are inherently difficult to capture in a simple metric because of the wide variation in incentive programs offered across states. They are incorporated in this analysis via a count of the number of incentive programs that states offer. The counts are divided into the number of tax incentive programs and the number of non-tax incentive programs. Both of these counts may increase economic activity by attracting firms to a state. Tax incentive programs should lower the CIT base because states are providing tax breaks through these programs. Non-tax incentive programs may increase real economic activity as they lower business costs, although no independent effect on the tax base is expected.[19]

[18] The LLC structure also offers some advantages over S-corporations. For example, there is no limit on the number of members of an LLC whereas an S corporation is limited to 100 shareholders (75 before 2005).
[19] See Zodrow (2003) for a discussion of tax incentives.

Instruments for GSP. As previously mentioned, GSP is likely to be endogenous with respect to the CIT base. [20] The first-stage GSP instrumenting equation includes all of the explanatory variables in the CIT base equation plus a set of socio-economic instrumental variables that explain GSP but do not have independent effects on CIT bases. This specification is consistent with the literature that explains the determinants of economic activity as discussed in the above review of the locational effects of tax policy.[21] Most of this literature models locational decisions by constructing profit functions (or other related functions) to determine profitability, and correspondingly, the decision to locate into a region. In this framework, this literature considers variables such as measures of regional market demand, costs of producing in a particular location, and, of course, taxes. The following summarizes this (first-stage) equation:

$$\begin{aligned} GSP_{i,t} = {} & \beta_0 + \beta_1 \text{CIT Rate}_{i,t} + \beta_2 \text{PIT Rate}_{i,t} + \beta_3 \text{Sales Rate}_{i,t} + \beta_4 \text{Sales} \\ & \text{Factor Apportionment}_{i,t} + \beta_5 \text{Combined Reporting}_{i,t} + \beta_6 \text{LLC}_{i,t,} + \\ & \beta_7 \text{Throwback Rule}_{i,t} + \beta_8 \text{Tax Incentives}_{i,t} + \beta_9 \text{Non-Tax Incentives}_{i,t} + \\ & \beta_{10} \text{Population}_{i,t} + \beta_{11} \text{Median Income}_{i,t} + \beta_{12} \text{Pop Density}_{i,t} + \beta_{13} \text{Gov} \\ & \text{Exp}_{i,t} + \beta_{14} \text{Manu Wage}_{i,t} + \beta_{15} \text{Education}_{i,t} + \beta_{16} \text{Energy Price}_{i,t} + \varepsilon_{it,} \end{aligned}$$

where, as before, i and t are state and year indices.

Two measures of input costs are included. The first is the average hourly wage for manufacturing workers in a state. The second is a measure of overall energy

[20] To be precise, under perfect information the CIT base does not affect GSP directly, rather it is the parameters that define the base that affect GSP. However, given the complexity of CIT structures, firms may not separately consider every parameter that defines the CIT base and, under these circumstances, respond directly to the CIT base. The endogeneity of GSP with respect to the CIT base was examined by performing the regression to explain GSP as described. Then a second regression that explains the tax base as a function of GSP, the other variables listed above, and the error term from the first regression was performed. The error term was a statistically significant determinant of the tax base, indicating that GSP is indeed endogenous (Hausman, 1978).

[21] See, for example, Wasylenko and McGuire (1985).

prices in a state (including all forms of energy such as gas, electricity, etc). State population and median income are included to control for state size and demand. Population density is included because a high population concentration may influence the ability of firms to achieve economies of operation. Total state government expenditures per capita control for government size. Government size has an ambiguous theoretical effect; firms may be more likely to locate in a state with greater expenditures per capita recognizing the associated benefits of more public services. Alternatively, they could focus on the higher taxes accompanying larger governments and choose to locate elsewhere to the extent that per capita taxes and expenditures are correlated. The percentage of a state's residents (over age 25) who hold a baccalaureate degree or higher would likely influence GSP because many firms require an educated workforce.[22]

All regressions include state- and year-specific fixed effects to control for state and time specific factors not included in the model.[23] CIT bases and GSP are entered as natural logs to control for the scaling effects from the wide variation in GSP and CIT bases between large and small states. The time period of analysis, 1985 through 2001, is advantageous in that it began just before the Tax Reform Act of 1986, which potentially affected tax planning activity by reducing marginal federal corporate income tax rates, thereby increasing the relative value of avoiding state business taxes from the perspective of firms. This time span also allows for broad

[22] This education variable is not available for 1985-88, so these values were imputed based on the average rate of change in each state between 1980 and 1989.
[23] The model was also estimated using a random effects specification. However a Hausman (1978) test indicates that this specification is econometrically inappropriate because of correlation between the explanatory variables and the random effects.

changes across the business cycle. Table 1.4 presents summary statistics for all variables for the first and last years of the study and Table 1.5 provides variable descriptions and source notes.[24]

1.E Results and Discussion

This section first discusses the results from the baseline model. It then turns to a modified baseline model that includes the CIT rate interacted with other CIT structural parameters to more precisely identify the effects of these parameters. The section closes with another modification of the baseline model that considers the possibility that tax planning has replaced the locational distortions of tax policy over time.

Baseline Model

GSP Results. Table 1.1 presents results from the primary regression model. Estimates from the first stage equation indicate that the top CIT rate does not have a statistically identifiable effect on private sector economic activity. However, higher top PIT rates and sales tax rates are associated with lower levels of output. One possible explanation is that the sales tax and PIT each account for about one-third of state tax revenues (and large shares of business costs) while the corporate income tax currently generates only about six percent of state tax revenue. The magnitude of the PIT rate effect is relatively small: a one-percentage-point increase in the top PIT rate

[24] All tables for Part 2 are located in the appendix to Part 2.

decreases GSP by only 0.6 percent. In contrast, a one-percentage-point increase in the sales tax rate lowers GSP by 3.8 percent.[25]

The sales factor weight in the state CIT apportionment formula is also a statistically significant determinant of GSP. The model predicts that a sales factor weight increase from 33 percent to 50 percent would increase GSP by 1.7 percent. In addition, the number of non-tax incentive programs has a statistically distinguishable, but unexpected negative, relationship with GSP. The programs may offer lower benefits than the tax costs, so the net effect is a reduction of economic activity. Alternatively, this variable could be endogenous with gross output if more non-tax incentive programs are developed in low output states.

Some of the other control variables in the first stage of the model also deserve attention. As would be expected, states with higher populations and those with a higher median income have higher GSP. Interestingly, states with higher state government expenditures per capita tend to have lower GSP. The overall relationship between government spending and total output is not captured because the GSP measure excludes government spending; this result could simply reflect the crowding out of private output. States with higher average wages for manufacturing workers have more economic output. This likely suggests that more skilled workers, as evidenced by greater salaries, result in greater output. In addition, more highly educated populations are associated with higher GSP.

[25] The sales tax effect translates into an elasticity of 0.2. That is, a one-percent increase in the sales tax rate yields a -0.2-percent decrease in GSP (based on the average sales tax rate of 4.6 percent in 2001). This magnitude is within the range of tax elasticiy estimates discussed in Wasylenko (1997).

Corporate Income Tax Base Results. Results from the second stage of the model indicate that GSP is highly significant in explaining the CIT base with an estimated elasticity of 0.64. The lack of statistical significance on the constant term in this equation, combined with the significance of GSP, indicate that the CIT base fundamentally follows from GSP, as would be expected.

A one-percentage-point increase in the top CIT rate is associated with a 7.2 percent decrease in the corporate income tax base, holding GSP and all else in the model constant.[26] The relationship between the CIT rate and base is attributable to tax planning activities because holding GSP constant eliminates the effect of locational distortions on the base. Further, the CIT base declines by 1.6 percent following a one-percentage-point increase in the PIT rate, again attributable to tax planning. As previously stated, when faced with higher tax rates in the PIT system, owners may be cost-justified in seeking more tax planning opportunities.

Several other tax variables are statistically significant in explaining the CIT base. Higher sales factor weights are associated with higher CIT bases. Many firms may have more sales in a state relative to payroll or property and, accordingly, will have higher CIT liabilities with higher sales factor weights. The model provides no evidence that state efforts to limit tax planning are effective. Combined reporting requirements and throwback rules have no effect on CIT bases in this context. These policies receive more attention in the next section. The model also fails to find evidence that allowing LLCs erodes the CIT base. Fox and Luna (2004) use a

[26] This translates into an elasticity of –0.48 (based on the average top CIT rate of 6.6 percent for 2001).

different CIT base measure and find that advent of LLCs lowered tax revenues, but only when the analysis is run without fixed effects for time. The result found here may also be due to a high degree of correlation between the LLC dummy and the year fixed effects. In addition, as expected, more tax incentive programs reduce the CIT base. More non-tax incentive programs are associated with higher CIT bases, holding GSP constant. Perhaps firms pursue tax planning strategies less aggressively when offered more non-tax incentive programs, thereby increasing the tax base.

Several pieces of policy-relevant information can be drawn from this first section of this study. The sales and personal income taxes have statistically significant and negative effects on economic activity in states, although the effect of the personal income tax is small. On the other hand, the corporate income tax does not have a significant effect. Significant evidence emerges from this study relevant to the design of an optimal corporate income tax system. Specifically, results provide highly suggestive evidence that, with higher corporate income tax rates, tax planning activity significantly diminishes corporate income tax bases. Policymakers should be aware of the large tax-planning-related base erosion that would likely follow an increase in corporate income tax rates.

Baseline Model Modified to Include CIT Rate Interactions

Table 1.2 presents a set of results similar to those in Table 1.1 with the difference being the inclusion of interactions of the top CIT rate with the sales factor weight in the CIT apportionment formula, combined reporting requirements, throwback ruless, and LLC allowances. This specification allows for a more in-depth

examination of the effects of these variables because it more precisely identifies how the effects of CIT rates differ across apportionment formulas, combined reporting, throwback rule, and LLC allowance environments, and vice versa. This framework is especially important given that it is likely that many firms consider state tax structures from a broad perspective (i.e., rates and other policies in conjunction) rather than from a narrow or individualist perspective.

GSP Results. In contrast to the baseline results, the model with CIT rate interactions identifies a significant relationship between CIT rates and GSP, though with an unexpected, positive sign. The effect is small in states that apply a one-third weight to sales in their CIT apportionment formulas. The effect becomes negative and increasing in magnitude with the addition of LLC allowances and throwback rules, and when raising the sales factor in the CIT apportionment formula. A significant relationship between GSP and combined reporting is not identified in this model. Other results are similar to those in the baseline model.

CIT Base Results. This regression finds no separate effect of the CIT rate on tax planning. Instead, the rate only has an effect as it interacts with other components of the tax structure. Thus, this specification suggests that firms do not engage in tax planning unless states introduce other elements of the tax structure that raise overall tax burdens.[27] Tax planning is found to depend upon whether states have combined reporting requirements and throwback rules. For example, a state with both of these policies would experience a decline in its CIT base of 11.8 percent following a one-

[27] This result is consistent with the Hines (2002) observation that government efforts to reduce tax planning may have the perverse effect of raising compliance costs without generating additional tax revenues.

percentage-point increase in the top marginal CIT rate. Apportionment formula differences and LLC legislation is found to have no effect on the amount of tax planning. Results regarding the sales and personal income tax rates, and tax and non-tax incentives, are largely similar to those of the baseline model, but the sales factor apportionment is not significant in this context.

The interaction terms can also be analyzed from the perspective of how the effects of combined reporting requirements, throwback rules, LLC allowances, and raising the sales factor differ as top CIT rates are increased. Imposition of a throwback rule is effective in restoring the CIT base when the top CIT rate is lower than 7.4 percent (ignoring locational effects). However the imposition of a throwback rule will actually reduce the CIT base where the CIT rate is higher than 7.4 percent. Twenty-six of the 44 income taxing states have a top CIT rate above 7.4 percent, suggesting that throwback rules often reduce CIT bases, independent of locational effects. This result could be interpreted as evidence that firms will pursue tax planning strategies when the throwback rule, combined with high CIT rates, render them cost-justified. Imposing a combined reporting requirement would aid in restoring the CIT base at any top CIT rate below 10 percent. Therefore, a combined reporting requirement restores the tax base in most cases because only four states had a top CIT rate that exceeded 10 percent (as of 2001). It should be noted that throwback rules and combined reporting requirements are not significant in the baseline model but are significant in the detailed model. These results should be interpreted to mean that the average (for all state) effect of these variables is zero (as

in the baseline), but they do have a negative effect in higher-tax-states and a positive effect in lower-tax-states.

This section includes important policy implications. Specifically, combined reporting requirements aid in restoring corporate income tax bases in most cases. In addition, the empirical evidence does not indicate that these requirements diminish economic activity in states. Alternatively, results indicate that throwback rules are often not effective in restoring corporate income tax bases. Furthermore, the evidence suggests that they diminish economic activity in states with high CIT rates.

Tax Planning Over Time

A third component of this study examines whether tax planning has increased over time and whether tax planning has replaced locational distortions. Two means are used to investigate whether planning has been changing over time. First, the baseline model is run again with an interaction term between the year fixed effects and the top marginal CIT rate. Second, a model is estimated in which the year fixed effects are replaced with a time trend and an interaction between the time trend and the top CIT rate.[28] Results from the latter model are presented in Table 1.3. Results from the former model are omitted because the model with 15 year fixed effects and 15 interactions between the year fixed effects and the top CIT rate is cumbersome and results are largely similar.[29]

[28] The time trend takes on the values of 1 to 17 for the years 1985 through 2001, respectively.
[29] The only difference between the specification with year fixed effects and a year time trend is the effect of LLC allowances. In the latter model, the LLC allowance variable is positive and significant while it is not in the former. This variable is probably identifying a time effect in the time trend model given the pattern of LLC introductions.

The first goal is to understand how effects of the tax rate on the tax base differ over time, holding GSP constant. The results from these models do not identify a significant difference in the effect of the CIT rate on the CIT base over time, roviding evidence that tax planning was equally prevalent throughout the period of analysis.[30]

If tax planning and locational responses to tax policy are substitutes, the effect of the CIT rate on GSP might decline over time if firms are beginning to use financial arrangements to avoid taxes, as opposed to locational responses. This question is examined in the first stage of the model. However results from this model indicate that the corporate income tax rate actually has a larger (negative) effect on GSP over time. A possible explanation for this puzzling result is that new technologies may enhance firms' abilities to produce remotely, by increasing firm mobility. Perhaps this effect dominates any tax planning effect. In other words, firms may have a growing ability to produce in one state and sell nationwide given the increased use of on-line shopping and better information technologies. Therefore, firms can respond more strongly to taxes because they need not be in a particular location to serve their customers. Further research is required to verify this hypothesis. All other findings of this model are similar to the baseline model with the exception of the combined reporting variable (and LLC allowances as noted). Here a combined reporting requirement has a positive and statistically effect on the CIT base.

[30] A third model is estimated that included a quadratic time trend and the corresponding CIT rate interaction. The coefficients on the quadratic terms are not statistically different from zero in this model, and other results are largely unchanged.

1.F Conclusions

In this paper an econometric model is developed to test the extent to which tax planning activities in response to differences in state business tax policies have affected state corporate income tax bases. Results strongly suggest that tax planning activity significantly diminishes taxable corporate profits in high tax states. In particular, state corporate income tax bases decline by around seven percent following a one-percentage-point increase in the top corporate income tax rate, holding Gross State Product and other state policy parameters constant. More in-depth analysis provides evidence that throwback rules are not effective in restoring state corporate income tax bases in most states. This result can be interpreted as evidence that firms seek out more planning opportunities when they are cost-justified by high corporate tax rates combined with a throwback rule. In contrast, combined reporting requirements are found to be somewhat effective in restoring corporate tax bases in most cases, but their effect is lessened with higher tax rates.

No evidence is found that the effects of tax planning on state corporate income tax bases have grown over time. In addition, findings do not indicate that tax planning activity has replaced locational responses to tax policy over the past decade and a half.

These findings are very important for policymakers to consider in designing optimal corporate income tax systems. First, policymakers should consider significant tax-planning-related base erosion that would likely follow an increase in the corporate income tax rate. Second, if policymakers decide that restoring, or at least maintaining, the corporate income tax base is desirable, evidence suggests that

combined reporting requirements are often effective in partially achieving this goal. At the same time, there is no evidence that these requirements diminish economic activity in states, alleviating concerns that these requirements would erode economic activity. Next, results provide no evidence that tax planning activity is a contributor to the recent corporate income tax base erosion. Further research is needed to better understand the causes of this trend. Last, results indicate that the sales tax rate significantly diminishes economic activity in states while corporate income and personal income taxes have either statistically insignificant or very small effects.

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Appendix

Table 1.1: Baseline Model

Variable	First Stage Ln Gross State Product	Second Stage Ln CIT Base
Top Corporate Income Tax Rate	-0.005	-0.072***
	(0.004)	(0.013)
Top Personal Income Tax Rate	-0.006***	-0.016**
	(0.002)	(0.006)
Sales Tax Rate	-0.038***	0.016
	(0.008)	(0.024)
Sales Factor Apportionment	0.001*	0.003**
	(0.0004)	(0.001)
Combined Reporting	-0.013	0.065
	(0.016)	(0.047)
LLC	0.007	-0.020
	(0.012)	(0.035)
Throwback Rule	0.031	-0.042
	(0.021)	(0.063)
Tax Incentives	-0.001	-0.008***
	(0.001)	(0.003)
Non-Tax Incentives	-0.005***	0.007**
	(0.001)	(0.003)
Population	0.055***	-
	(0.007)	-
Median Income	0.004***	-
	(0.001)	-
Population Density	0.0001	-
	(0.0003)	-
State expenditures per capita	-0.036***	-
	(0.013)	-
Average Manufacturing Wage	0.037***	-
	(0.006)	-
Education	0.003*	-
	(0.002)	-
Energy Price	-0.008	-
	(0.006)	-
Ln GSP	-	0.643***
	-	(0.243)
Constant	17.75***	-0.71
	(0.15)	(4.54)
Within R-squared	0.949	0.571

Entries are fixed-effcts panel regression coefficients with standard errors in parentheses.

*, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

Regressions include state and year fixed effects.

All percentages are on a 0-100 scale.

Population is measured in thousands.

Median income, GSP, and state expenditures per capita are measured in thousands of current year dollars.

Table 1.2: Results with CIT Rate Interactions

Variable	First Stage Ln Gross State Product	Second Stage Ln CIT Base
Top Corporate Income Tax Rate	0.036**	-0.001
	(0.012)	(0.037)
Top Personal Income Tax Rate	-0.007***	-0.016**
	(0.002)	(0.007)
Sales Tax Rate	-0.047***	0.007
	(0.008)	(0.025)
Sales Factor Apportionment	0.005***	0.005
	(0.002)	(0.006)
CIT Rate*Sales Apportionment	-0.0005**	-0.0002
	(0.0002)	(0.001)
Combined Reporting	0.039	0.340**
	(0.054)	(0.165)
CIT Rate*Combined Reporting	-0.004	-0.034*
	(0.007)	(0.020)
LLC	0.072***	-0.037
	(0.016)	(0.052)
CIT Rate*LLC	-0.010***	0.003
	(0.002)	(0.006)
Throwback Rule	0.249***	0.594***
	(0.062)	(0.202)
CIT Rate*Throwback Rule	-0.030***	-0.084***
	(0.008)	(0.026)
Tax Incentives	0.0002	-0.007**
	(0.001)	(0.003)
Non-Tax Incentives	-0.004***	0.008**
	(0.001)	(0.003)
Population	0.050***	-
	(0.006)	-
Median Income	0.004***	-
	(0.001)	-
Population Density	0.0003	-
	(0.0003)	-
State expenditures per capita	-0.023*	-
	(0.013)	-
Average Wage	0.035***	-
	(0.006)	-
Education	0.004**	-
	(0.002)	-
Energy Price	-0.008	-
	(0.006)	-
Ln GSP	-	0.494*
	-	(0.255)
Constant	17.41***	1.57
	(0.16)	(4.71)
Within R-squared	0.952	0.574

Entries are fixed-effcts panel regression coefficients with standard errors in parentheses.

*, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

Regressions include state and year fixed effects.

All percentages are on a 0-100 scale.

Population is measured in thousands.

Median income, GSP, and state expenditures per capita are measured in thousands of current year dollars.

Table 1.3: Results with CIT Rate Interacted With Time

Variable	First Stage Ln Gross State Product	Second Stage Ln CIT Base
Top Corporate Income Tax Rate	0.002	-0.076***
	(0.005)	(0.014)
Top Personal Income Tax Rate	-0.008***	-0.016**
	(0.002)	(0.007)
Sales Tax Rate	-0.038***	0.027
	(0.008)	(0.026)
Sales Factor Apportionment	0.001**	0.002*
	(0.0004)	(0.001)
Combined Reporting	0.006	0.086*
	(0.016)	(0.048)
LLC	0.024**	0.057*
	(0.010)	(0.031)
Throwback Rule	0.029	-0.054
	(0.020)	(0.064)
Tax Incentives	0.0003	-0.010***
	(0.001)	(0.003)
Non-Tax Incentives	-0.005***	0.009***
	(0.001)	(0.003)
Population	0.044***	-
	(0.006)	-
Median Income	0.003**	-
	(0.001)	-
Population Density	0.001*	-
	(0.0003)	-
State expenditures per capita	-0.022*	-
	(0.013)	-
Average Wage	0.027***	-
	(0.006)	-
Education	0.003*	-
	(0.002)	-
Energy Price	-0.008*	-
	(0.004)	-
Ln GSP	-	0.754***
	-	(0.287)
CIT Rate*Time Trend	-0.001***	0.001
	(0.0002)	(0.001)
Time Trend	0.051***	-0.021
	(0.003)	(0.020)
Constant	17.10***	-2.44
	(0.09)	(5.07)
Within R-squared	0.949	0.536

Entries are fixed-effcts panel regression coefficients with standard errors in parentheses.

*, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

Regressions include state fixed effects.

All percentages are on a 0-100 scale.

Population is measured in thousands.

Median income, GSP, and state expenditures per capita are measured in thousands of current year dollars.

Table 1.4: Summary Statistics

	1985		2001	
	Mean	**Std.Dev.**	**Mean**	**Std.Dev.**
Non-Government Gross State Product (millions)	72,000	87,300	178,000	217,000
Corporate Income Tax Collections (thousands)	265,564	334,276	590,840	1,091,370
Top Corporate Income Tax Rate	6.5	3.2	6.6	2.9
Top Personal Income Tax Rate	6.9	4.9	5.6	3.2
Sales Tax Rate	4.1	1.7	4.6	1.8
Sales Factor Apportionment	32.6	16.1	42.2	22.6
Combined Reporting	0.18	0.39	0.28	0.45
Throwback Rule	0.49	0.50	0.46	0.50
LLC	0	0	1	0
Tax Incentives	10.2	1.9	8.6	6.1
Non-tax Incentives	4.7	2.7	12.56	7.99
Population (thousands)	4,745	5,068	5,694	6,300
Median Income (thousands)	32.0	4.0	62.0	9.0
Population Density	160	228	184	253
State expenditures per capita (thousands)	1.8	1.1	4.3	1.2
Average Wage	9.4	1.2	14.5	1.6
Education	18.5	3.6	25.4	4.3
Energy Price	8.5	1.1	10.0	1.6

Notes: All percentages are on a 0-100 scale.

All dollar amounts are expressed as current year dollars.

Table 1.5: Data Descriptions and Source Notes

Variable	Definition
Non-Government Gross State Product	Total Gross state product less GSP from government sector. (1)
Corporate Income Tax Base	Corporate income tax (CIT) revenues divided by top marginal CIT rate. (2)
Top Corporate Income Tax Rate	Highest marginal corporate income tax rate. (3)
Top Personal Income Tax Rate	Highest marginal personal income tax rate. (3)
Sales Tax Rate	General sales tax rate. (3)
Sales Factor Apportionment	Weight given to sales factor in the corporate income tax apportionment formula. (3)
Combined Reporting	1 if a state has a combined reporting requirement. (3)
Throwback Rule	1 if a state has a throwback rule. (4)
LLC	1 if a state allows LLCs. (5)
Tax Incentives	Number of tax incentive programs a state offers. (6)
Non-Tax Incentives	Number of non-tax incentive programs a state offers. (6)
Population (thousands)	State population. (7)
Median Income (thousands)	State median income. (7)
Population Density	Population/square miles in a state. (8)
State expenditures per capita (thousands)	State government expenditures/population. (9)
Average Wage	Average hourly wage for manufacturing workers. (10)
Education	Percent of population over age 25 that hold at least a Bachelor's degree. (7)
Energy Price	Estimate of energy costs for all forms of energy, measured per million Btu. (11)

Table 1.5 (cont.): Data Descriptions and Source Notes

Source Notes:

1. *Regional Economic Accounts* , Bureau of Economic Analysis, various years.
2. Author's calculations based on data from *State Government Finances* , U.S. Census Bureau, various years, and *State Tax Handbook* , Commerce Clearing House, various years.
3. *State Tax Handbook* , Commerce Clearing House, various years.
4. *State Tax Handbook* , Commerce Clearing House (various years) and various state revenue departments.
5. www.llcweb.com
6. National Association of State Development Agencies, various years.
7. *Statistical Abstract of the United States* , U.S. Census Bureau, various years.
8. Author's calculations based on data from *Statistical Abstract of the United States* , U.S. Census Bureau, various years.
9. Author's calculations based on data from *State Government Finances* , U.S. Census Bureau, various years.
10. Employment and Wages, U.S. Bureau of Labor Statistics, various years.
11. *Energy Price Estimates by Source* , U.S. Department of Energy, various years.

Part 3

Essay Two:

State Tax Policy and Entrepreneurial Activity

2.A Introduction

The interplay between tax policy and entrepreneurial activity has enjoyed a resurgence in the empirical economics literature. Most of the recent research has focused on *federal* taxes, however, leaving *state* tax policies relatively unexplored. As states continue to grapple with difficult issues in business taxation and development incentives, a thorough consideration of the effects of state tax policies on entrepreneurial activity becomes even more important, especially when considering the possible benefits that could follow new entrepreneurial ventures through economic growth, innovation, etc. In this essay, the relationships between state tax policy and entrepreneurship are examined using a longitudinal database of detailed information on state tax policies for all 50 U.S. states from 1989 through 2001.[31]

This investigation is warranted for a number of reasons. First, as a result of the focus on federal taxes, earlier research has only considered a subset of the taxes facing small businesses. For example, Cline, Fox, Neubig, and Phillips (2003a and 2003b) show that the total state and local tax burden for U.S. businesses includes much more than direct business taxes such as corporate income taxes or state franchise, excise, or gross receipts taxes. Businesses—especially small businesses—also pay significant amounts of property and sales taxes, along with a growing menu of miscellaneous charges and fees. The existing array of state tax structures provides

[31] A preliminary version of this study was published as Bruce, Deskins, and Mohsin (2004).

a virtual cornucopia of exogenous policy variation that can be used to cleanly identify entrepreneurial responses.

While it is unsurprising that taxes can affect entrepreneurial activity in many ways, debate continues over whether tax policies should be designed to explicitly favor small businesses. Those who favor small business subsidies argue that entrepreneurs fuel economic growth and create jobs, thereby providing positive spillovers. They also note that, if lenders are reluctant to finance risky entrepreneurial ventures, government financing may be necessary. In addition, some argue that the existing tax system provides disadvantages to small businesses and that future policy should favor small businesses to offset these disadvantages. Those opposed to tax benefits for small businesses cite the distortion that results from the misallocation of productive resources toward less efficient uses and the questionable evidence regarding the economic benefits of small businesses.

Regardless of one's stance in this broader debate, the extent to which tax policies actually influence entrepreneurial activity is unknown and thus deserves exploration. If taxes do not affect entrepreneurial activity, using tax policy to encourage innovation or growth through entrepreneurship is not likely to be fruitful. Alternatively, if a nonzero effect can be determined, the actual parameter estimates can be used to more efficiently design tax policy to achieve desired changes in entrepreneurship.

Results of this study indicate that statutory tax rates for personal income, corporate income, and sales do not have statistically significant effects on observed rates of entrepreneurship or a state's share of the national entrepreneurial stock.

However, other elements of state tax policy, such as combined reporting requirements, throwback rules, and personal income tax progressivity can have significant effects in many instances. Results do not identify a significant relationship between a state's relative reliance on a particular tax and observed entrepreneurship.

2.B Existing Literature

Two broad areas of study in the earlier literature motivate this analysis. The first is the literature on the effects of state tax policies on business location decisions. These results are important because business location decisions can have important impacts on measured entrepreneurship or self-employment rates. In his oft-cited review of a vast array of empirical studies, Wasylenko (1997) concludes that taxes have statistically significant but quantitatively small effects on interregional location behavior. In a similar vein, Bartik (1991), in an earlier and very popular review of this literature, concludes that higher state and local taxes reduce business activity in a region with an elasticity of about -0.3, while noting significant deviation from this average across studies.[32] However, this literature may be slightly less relevant to the present study because larger firms that span state boundaries are probably more likely to respond to tax-based incentives since they are likely more flexible in terms of location.

[32] See also Ladd (1998).

The second broad area of relevant literature consists of empirical studies of taxation and entrepreneurship. The number of studies in this literature has grown significantly in recent years, largely due to greater availability of useful data. Relevant studies in this area can be divided into three more specific categories: time series studies, microdata studies, and state-level panel analyses. While the first two groups serve as important motivators for this work, the third is most closely related to the present study and is discussed in significantly greater detail below.

Older time series studies focus on federal tax policies but rely on time series econometric techniques that have since been found to be problematic. These studies generally conclude that higher federal tax rates cause higher rates of entrepreneurship, specifically defined as self-employment (Long [1982] and Blau [1987]). Explanations often rest on the idea that high tax rates drive workers out of paid employment, or wage jobs, into entrepreneurial ventures where they can more easily avoid or evade taxes. However, despite significant advances in econometric techniques, more recent studies using modern time series methods find similar positive relationships between tax rates and entrepreneurial activity (Parker [1996], Cowling and Mitchell [1997], and Robson [1998]). None of these studies consider the effects of state taxes.

Despite the consistency of the larger group of times series studies, a more recent and extensive time series analysis in this area, Bruce and Mohsin (2003), shows that the question of how taxes affect entrepreneurship is not yet settled. In addition to personal income and payroll taxes, Bruce and Mohsin consider corporate income taxes, capital gains taxes, and estate taxes. Results generally indicate that

taxes have statistically significant but very small and scattered effects on entrepreneurship rates. Consequently, they are likely to be ineffective in generating desired changes in entrepreneurial activity.

The second group of studies relies on cross-sectional or panel micro data to examine the influence of tax policies on individual decisions about entrepreneurship. Results from these studies, which use even more sophisticated econometric techniques and examine more broadly defined entrepreneurial activities, have also been inconclusive (Bruce [2000 and 2002], Carroll, Holtz-Eakin, Rider, and Rosen [2001], Gentry and Hubbard [2000], Moore [2003], and Scheutze [2000]). Indeed, some of them have indicated that higher tax rates on self-employment income have ambiguous effects on self-employment rates. The key to understanding this conclusion is realizing that a higher tax rate reduces not only the expected return from self-employment, but also the risk in self-employment. State taxes have been considered in only a portion of these studies, and then only as a component of a combined federal and state income tax rate.

The final group of studies uses state-level time series or panel data to explicitly examine the effects of state tax policies on entrepreneurial activity and, therefore, is most relevant to the current paper. Carlton (1979) finds no strong evidence that local taxes influence the number of firm births. He uses rather rough proxies for tax variables, however, and only considers three industries for a limited time period. Bartik (1989) uses more detailed tax information and a broader array of industries and finds that higher property taxes, corporate taxes, and sales taxes on

equipment negatively impact small business start-ups.[33] He also finds that personal income taxes and general sales taxes are not statistically significant, while government spending has mixed effects depending on the category of spending. His survey of earlier studies finds elasticities that are generally below 0.5 in absolute value.

Chen and Williams (1999) examine business failure rates from 1984 through 1993, estimating panel regressions for each of a number of industry categories. Although their focus is not exclusively on small businesses, they find that higher sales taxes per capita increase business failure rates for low-tech industries, while higher corporate income taxes per capita lead to lower failure rates for high-tech industries. Kreft and Sobel (2003) find that the existence of state inheritance taxes above the federal level is associated with lower rates of growth in the number of sole proprietors between 1996 and 2000.

The empirical framework of this study most closely resembles that of Georgellis and Wall (2002), who use panel regressions to examine the various determinants of state-level entrepreneurship.[34] Using data from 1991-1998, they find that the maximum (state plus federal) marginal tax rate exerts a u-shaped effect on the number of non-farm sole proprietors as a share of the working-age population. An increase in the marginal tax rate (MTR) reduces entrepreneurship up to a minimum

[33] Bartik (1989) extended the preliminary results in Bartik (1987).
[34] Georgellis and Wall (2000) develop the theory and empirical methods that are the foundation for this more recent paper, but the focus in the earlier paper is on British data and no regional tax policy variables are considered.

effect at an MTR of about 35 percent, after which MTR increases lead to more entrepreneurial activity. No other tax variables are included in their analysis.

In sum, the previous literature has found that state tax policies can be important determinants of entrepreneurial activity, but magnitudes, signs, and statistical significance levels have not been conclusive, warranting additional research. The present study expands upon the earlier literature in several ways. First, the study considers a much broader set of tax policies in addition to the usual menu of tax rates. Second, both a state's entrepreneurial stock as well as its share of national entrepreneurship are examined to understand how state tax policy both fosters entrepreneurship within a state as well as the location of entrepreneurship across the nation. Third, this study goes beyond explicit tax policy variables to examine the influence of state tax portfolios (i.e., the share of total state taxes generated by each tax) on entrepreneurial activity. Finally, it uses more recent data, covering the period from 1989 through 2001, and tests for robustness using alternative measures of entrepreneurial activity.

2.C Data and Empirical Methodology

Entrepreneurship Measures

The baseline empirical approach follows that of Georgellis and Wall (2002) and consists of panel regressions that explain state rates of entrepreneurial activity as a function of tax variables and other controls. The first question is what to use as the appropriate measure of entrepreneurship. Nearly all studies in this literature struggle with the definition and measurement of entrepreneurship. Indeed, the notion of

"entrepreneurial spirit" is something of an elusive concept. Therefore, a proxy must be used. To this end, most of the prior studies have used a variant of a self-employment rate or a firm birth rate, primarily because these are the easiest measures to obtain. Given that not all entrepreneurs are self-employed and that not all self-employed workers can be considered entrepreneurial, this study considers two different measures of state entrepreneurship. The first is the number of federal individual income tax returns with income from a small business or profession (Schedule C) as a share of all individual income tax returns filed from each state. The second is based on data from the Bureau of Economic Analysis (BEA) and counts the share of all workers in each state who are sole proprietors.[35]

In the analysis that follows, these entrepreneurial measures are viewed in two distinct ways. The first is to measure the figures simply as the stock of entrepreneurship in a state, as described above. In addition, these measures are converted into state shares of the national entrepreneurial stock. The first point of view, entrepreneurial stock, will provide an understanding that abstracts from cross-state locational effects of tax policy on entrepreneurship. The focus here is on the effect of tax policy on the tendency to start and maintain a small business. This approach is useful because many entrepreneurs are involved only in smaller operations that do not span state boundaries. Alternatively, the entrepreneurial share specification addresses the possibility that some entrepreneurs cross state lines and are responsive to tax policies in other states. This view will allow the results to be

[35] A third useful measure of entrepreneurship is those individuals who receive income from other small businesses such as partnerships or S-corporations. However, state-level data on income from these sources is not widely available.

expressed more in terms of the effects of state tax policies on the allocation of entrepreneurial activity across the states.[36]

The first four columns of Table 2.1 present values of both the tax return and employment measures for each state's entrepreneurial stock.[37] Data are shown for 1989 and 2001 to provide a sense of the changes in entrepreneurial activity across states and over time. A few key themes emerge from this table. First, states with higher rates of entrepreneurial activity for the tax return measure typically have higher rates for the employment measure, although a number of exceptions arise in the data. In fact, the correlation coefficient between these two variables is 0.89. Second, as shown by Georgellis and Wall (2002), entrepreneurial activity has grown over time in most states. Figure 2.1 displays the average of both measures of entrepreneurial stock across all 50 states over the time period of the analysis. While the employment measure appears to have grown steadily, the tax return measure grew quickly and then leveled off in the early 1990s. The last four columns of Table 2.1 present state shares of the total entrepreneurial stock in the nation by each of the two measures. The two entrepreneurial share measures are also similar. However, it appears that state shares of entrepreneurship typically did not change by large amounts between 1989 and 2001.

[36] The tax return measure of state entrepreneurial share is the ratio of the number of personal income tax returns with a Schedule C in a state to the number of returns with a Schedule C in the nation. The employment-based measure is calculated as the number of self-employed individuals in a state divided by the national total of self-employed individuals.
[37] All tables and figures for Part 3 are located in the appendix to Part 3.

Statutory Tax Rates

The first task in this study is to uncover the various determinants of state and time variation in entrepreneurial activity, focusing primarily on the role of state tax policies. In the spirit of the prior literature, this analysis begins with a consideration of statutory tax rates. Figure 2.2 shows averages across the 50 states of the top marginal corporate income tax (CIT) rate, the top marginal personal income tax (PIT) rate, and the state sales tax rate for the time period of our analysis.

Corporate income taxes can influence entrepreneurial activity in a few ways, one being decisions regarding organizational form. If CIT rates are high relative to PIT rates, for example, new businesses might choose to organize as unincorporated sole proprietorships to reduce taxes. This effect is artificial in that it only alters measured entrepreneurship, not true entrepreneurial activity. A second influence could be that high CIT rates could indicate that a state prefers to shift relatively more of its tax burden onto large businesses, perhaps indicating that a state is anti-big-business, or alternatively, pro-small-business. As shown, top CIT rates have remained relatively stable, increasing only slightly during the mid-1990s. It remains to be seen whether this small increase contributed to the growth in entrepreneurial stocks shown in Figure 2.1.

Personal income taxes can affect entrepreneurs in many ways. As PIT rates increase, the returns to small business activity decline for sole proprietors. In addition, personal income taxes can insure against risk. Top PIT rates increased dramatically around the recession of the early 1990s but have gradually fallen since

then to around their 1990 level. Again, the extent to which this trend has influenced entrepreneurial activity remains to be seen.

Although CIT and PIT rates are clearly important to small businesses, Cline, et al. (2003a and 2003b) show that other state and local taxes are more important in practice. For example, it is well known that businesses are responsible for a significant share of state and local sales taxes (Ring, 1999). As sales tax bases have eroded in recent years (Bruce and Fox, 2000), state sales tax rates have grown slightly as shown in Figure 2.2. If this growth represents a net increase in business taxes, this trend could have influenced state entrepreneurship rates.

Other Elements of State Tax Policy

The analysis that follows moves beyond statutory tax rates and considers a number of other aspects of state tax policies. Unfortunately, the diversity of tax rules surrounding state property taxes on business makes empirical consideration of them quite difficult. Nonetheless, it is possible to control for a variety of other potentially relevant policies. Included first is a set of policy indicators involving state CIT structures. These indicators consist of the sales factor weight in each state's CIT apportionment formula and dummies for the presence of a combined reporting requirement, a throwback rule, and legislation allowing limited liability corporations (LLCs).

The sales factor weight in the CIT apportionment formula is potentially important as higher sales factor weights are intended to shift the CIT burden from multi-state businesses that manufacture within a state to those that manufacture out-

of-state. Thus, higher sales factor weights might be associated with more entrepreneurial activity within a state's borders.

The presence of combined reporting or throwback rules might represent a state's overall effort to shift a larger part of its tax burden onto businesses. This effect relates to entrepreneurship in that a tax climate that attempts to shift the tax burden onto businesses could potentially discourage entrepreneurs from starting new businesses. On the other hand, in similar fashion to high CIT rates, combined reporting or throwback rules could indicate that a state is anti-big-business or more favorable toward small businesses. This bias actually could foster small business and increase entrepreneurship. Here, it is important to note that it is not asserted that combined reporting or throwback rules directly affect small businesses. Indeed, a small businessperson need not even be aware of these rules in the context of this argument. These policies may simply be representative of a tax climate in a state. In other words, the tax climate more generally could affect entrepreneurship, not the particular combined reporting or throwback policies, which are simply reflective of the larger climate.

Finally, observed rates of entrepreneurship are expected to be higher in states that allow LLCs (or allowed them first since all states allowed LLCs by the end of 1997) because LLC owners (single owner LLCs only) would file a Schedule C with their federal return or call themselves self-employed on a labor market survey. Of course, this change only represents a change in organizational form and not an increase in economic activity.

To incorporate additional elements of state policy, the study also includes a simple count of the number of tax and non-tax incentive programs that states offer to encourage economic development. It is expected that individuals and firms might respond to incentive packages offered by government for business development. However, an incentive variable may not perfectly correspond to entrepreneurship as many of the incentives are targeted at large, pre-existing firms or new branches thereof.

A dummy variable for whether a state imposes an inheritance, estate, or gift tax, above the federal tax, in a given year is also included.[38] These taxes may reduce the amount of entrepreneurship in a state by reducing the size of an entrepreneurial enterprise upon passage from an original owner to an heir or the survival probability of a small business (see Conway and Rork, 2004). Homestead exemptions for bankruptcy proceedings also may affect entrepreneurship by reducing the riskiness of entrepreneurial ventures. The potential losses from an unsuccessful entrepreneurial venture will be lessened as the dollar amount of housing investment that is exempt from being seized upon filing bankruptcy increases (see Berkowitz and White, 2004). Therefore, the dollar amount for the homestead exemption for each state and a dummy variable to denote those states that have an unlimited homestead exemption are included.[39]

[38] By 2001 most states had eliminated their inheritance, estate, and gift taxes. Instead, they rely on a "pick-up" tax, which captures a portion of federal tax liability and does not reduce the overall tax liability on the estate.

[39] For those states with an unlimited homestead exemption, the exemption amount of the state with the largest homestead exemption for the homestead exemption variable was used. Therefore, the coefficient on the unlimited exemption dummy can be interpreted as the marginal effect of having an unlimited exemption relative to the state with the highest (finite) exemption amount.

Using the change in the average PIT rate (PIT liability divided by state personal income) given a change in income controls for the progressivity of state PIT rate structures.[40] Gentry and Hubbard (2000) find that more progressivity leads to lower rates of entry into entrepreneurship, suggesting that progressivity serves as something of a tax on successful entrepreneurs. Greater progressivity also might serve as increased insurance against the risk of entrepreneurship, thereby increasing entrepreneurial activity.

Regarding organizational form effects and the business tax policy variables described above (e.g., combined reporting requirements and throwback rules), an important component of this study is to ensure that the effects of true increases in entrepreneurship are disentangled from artificial changes in observed entrepreneurship rates (following from changes in business organization). This point is especially important for the results surrounding the top CIT rate and combined reporting requirements and throwback rules. For example, it was argued above that a high CIT rate may increase entrepreneurship simply because it deters small businesses from incorporating. This argument can be interpreted as a simple shifting in the mix of entrepreneurs and incorporated firms rather than a true increase in business activity. This does not reflect the primary intent of this study. Fundamentally, it is most important to examine the relationship between taxes and

[40] Specifically, using a married couple with two children as a representative household, the change in the average PIT rate associated with moving from a certain amount below the median income for a family of four to that same amount above median income is calculated. The year 2000 equivalent of this income range is $20,000. In other words, for the year 2000, average PIT rates are calculated at $10,000 below and $10,000 above median income as of 2000. For other years, an income range that is equivalent to $20,000 in 2000 dollars is used.

small businesses creation, not changes in organizational form. Thus, the empirical method of this study ensures that the estimated effects of the relevant policy variables isolate true entrepreneurship increases (as described below).

Tax Shares

In a more significant departure from the previous literature, the analysis below considers the effects of state tax portfolios on entrepreneurial activity. Specifically, included are the shares of total state tax revenues generated by the CIT, the PIT, sales taxes, and business licenses and fees. This point of view is important for several reasons. First, to the extent that one tax is relatively more important in determining entrepreneurial activity, it stands to reason that states in which a particular tax is more important might have fewer small businesses than states that do not emphasize the particular tax. For example, some have argued that Tennessee should not impose a personal income tax because the absence of this tax encourages business development. Second, because the detail of the tax structure cannot be perfectly captured in a relatively simple statistical analysis, the share may serve as a proxy for the broader structure of the state tax system. As previously stated, this is especially important in light of recent research that reveals that businesses are faced with much more than just corporate income taxes or business license fees (Cline et al., 2003a and 2003b). In addition, it is important to understand how the changing composition of state revenue portfolios (i.e., a shift from sales and business taxes to personal income taxes) may affect small businesses. No other studies have been identified that

consider the relative merits of balanced state tax portfolios versus more concentrated tax structures in terms of their effects on entrepreneurial activity.

Figure 2.3 displays state averages of these four shares over time. As is widely known, sales taxes have been replaced by personal income taxes as the dominant source of state tax revenue, and the corporate income tax share has generally fallen over time. Business licenses continue to provide a small but steady share of total state taxes.

Other Control Variables

To control for state and time differences in the size and scope of government services, all models include measures of state taxes per capita and local taxes per capita. A higher overall tax burden may deter businesses. Conversely, they may foster business if businesses focus more on the associated public good expenditures. Non-tax explanatory variables include the state unemployment rate, median income, poverty rate, population density, the rate of job growth, and the share of gross state product (GSP) in the agricultural, service, and manufacturing sectors. The GSP shares may be important if entrepreneurship tends to be more viable in certain sectors. In regressions that explain entrepreneurial share, included are the total number of PIT returns for a state (tax return measure) or state population (employment measure) to control for state size. All panel regressions include fixed effects for state-level heterogeneity and fixed effects for the year of the observation to control for state-

invariant factors.[41] Table 2.5 presents summary statistics for each variable for the years 1989 and 2001, and Table 2.6 presents data descriptions and source notes.

2.D Results and Discussion

Effects of State Tax Rates and Rules on Entrepreneurial Stock

Results for fixed effects regressions of state entrepreneurship rates on statutory tax rates, other indicators of state tax policies, and the full set of non-tax controls are provided in Table 2.2. Statutory top marginal state corporate income and personal income tax rates do not have statistically significant effects on entrepreneurship rates. In contrast, results indicate that a one-percentage-point rise in the sales tax rate is associated with increases in the tax return and employment based measures of entrepreneurship of 0.165 and 0.113 percentage points, respectively. Given the average tax return and employment based measures of 14.2 percent and 16.2 percent, respectively, a one-percentage-point increase in the sales tax rate increases these entrepreneurship rates by only 1.2 percent (tax return) and 0.7 percent (employment).[42]

A few of the other included measures of state tax policy have a statistically significant impact on the two measures of entrepreneurial activity. First and foremost, states with a combined reporting requirement tend to have rates of

[41] The use of a random effects specification was considered but a Hausman (1978) test revealed that this was statistically inappropriate. Correlation between the regressors and the random effects will likely lead to biased coefficient estimates.

[42] The lack of statistical significance is not attributable to multicollinearity as diagnostics did not reveal a significant degree of correlation among the explanatory variables. In addition, rates were not significant in models that included only tax policy variables.

entrepreneurial activity that are about 0.67 (tax measure) or 0.44 (employment measure) percentage points higher than states without a combined reporting requirement.[43] In addition, a throwback rule is a significant determinant of employment based entrepreneurship but leads to a smaller increase than a combined reporting requirement. See below for further detail on these results.

The PIT progressivity measure has a positive and significant effect on the employment measure of entrepreneurship, contrary to the findings of Gentry and Hubbard (2000). While they found that increased convexity in the tax rate schedule reduced the probability of entry in entrepreneurship, these results indicate that states with more progressive PIT schedules have higher employment-based measures of entrepreneurship. This result is attributed to two possible effects. First, on the surface, more progressive tax rate schedules involve greater insurance against risk and, therefore, could serve as an incentive for entrepreneurial activity. Second, this result might also be picking up some correlation between tastes for income redistribution (as evidenced by PIT progessivity) and tastes for entrepreneurship or risk-taking at the state level, i.e., it may simply be that areas that prefer more income redistribution also have stronger tastes for entrepreneurship and risk-taking.

The allowance of LLCs also has an effect on the tax return based measure of entrepreneurship. States that allow LLCs (or, since all states now allow LLCs, those that allowed them first) have slightly higher tax-based measures of entrepreneurship

[43] One hypothesis could be that combined reporting captures regional effects since this requirement is more prevalent in western states. However, in the fixed effects model coefficient estimates are to be interpreted as holding state specific effects constant. Therefore, this effect is driven by changes in this policy *within* states over the timeframe of the analysis and cannot reflect regional effects.

despite the finding that employment-based entrepreneurship seems to be unaffected by this policy. This result is intuitive; as corporations reclassify themselves as LLCs or as LLCs are otherwise created, their owners (in the case of single ownership) must report income for tax purposes on a Schedule C even though they would not be more or less likely to call themselves "self-employed" on a labor market survey.

The number of tax incentives offered by states is associated with slightly higher rates of entrepreneurship. This result is intuitive as tax incentive programs are in part designed to encourage entrepreneurship; these results indicate they are having some success. However, according to this model, the impact of adding one additional tax incentive program is very small. One more incentive program increases entrepreneurship by 0.03 (tax measure) or 0.01 (employment measure) percentage points – an economically insignificant magnitude. The model estimates a negative relationship between non-tax incentive programs and employment based entrepreneurship. This relationship could be the result of the endogeneity of non-tax incentive programs; states offer more of these programs when economies are weak.

Although not the focus of this research, results for the remaining controls in Table 2.2 are worthy of additional discussion. Results show that entrepreneurship rates are higher with higher unemployment rates, echoing some of the earlier literature that finds that self-employment is often used as an alternative to wage employment when jobs are scarce. Nevertheless, results show that employment-based entrepreneurship is higher when job growth is higher. This result suggests that entrepreneurial activity also has pro-cyclical elements (i.e., more small businesses are formed during relatively favorable economic conditions).

Somewhat surprisingly, median income has a significant and negative impact on entrepreneurship rates according to this model. While much of the earlier micro-data studies have found a positive relationship between income and entrepreneurship at the individual level, this finding suggests that lower-income states tend to have more entrepreneurial activity. In contrast, higher poverty rates are associated with lower entrepreneurship rates (for the employment measure only).

The industrial structure of states is also an important determinant of state entrepreneurial activity when considering the employment based measure. States with larger shares of their GSP in the agricultural sector and smaller shares in their manufacturing sector tend to have higher rates of employment-based entrepreneurial activity. In addition, entrepreneurship is higher in more densely populated states.

Turning back to the results regarding combined reporting requirements and throwback rules, the presence of a these policies might represent an overall state tax climate that is anti-big-business and therefore pro-small-business on the surface. Alternatively, such policies might simply deter small businesses from incorporating.[44] It is important to understand whether this effect represents a true increase in entrepreneurship or whether it is simply a change in organizational form. Identical models to those in Table 2.2 except for the inclusion of the total number of non-self-employed firms in the state as an additional explanatory variable were estimated to

[44] A third possible explanation could involve tax planning activity. Perhaps, when firms are faced with combined reporting requirements and throwback rules (that are intended to increase tax liability), they are cost-justified in adopting tax planning strategies to offset these effective tax rate increases. Many possible tax planning strategies could involve the use of outside consultants rather than employees inside the firm. If so, this would increase the number of entrepreneurs based on the measures used here.

investigate this question.[45] In this context, the coefficients of the combined reporting and throwback rules are interpreted as the effect of these rules on the measures of entrepreneurship, holding the number of non-self-employed firms constant. Thus, any identified relationship is not because of reductions in the number of non-self-employed firms. Results indicate that, after including this control, a combined reporting requirement is still a statistically significant determinant of both measures of entrepreneurship and a throwback rule is statistically significant in the employment based entrepreneurship equation. Furthermore, the magnitudes of the coefficients are roughly the same as in the prior model. Thus, the appropriate conclusion is that the relationship between combined reporting and throwback rules on entrepreneurship is more than simple organizational form changes.[46]

Effects of State Tax Rates and Rules on State Shares of National Entrepreneurship

This section presents an examination of the effects of tax rates and rules on state shares of the national entrepreneurial stock. This consists of regression analysis similar to that presented in Table 2.2 with the primary difference being that, in this specification, the dependent variable is a state's share of the national entrepreneurial stock. Also included are controls for a state's size – the number of PIT returns in a

[45] Full results of this model are presented in Table 2.10.

[46] One note of caution with including the number of non-self-employed firms is a possible simultaneity bias. That is, not only could the number of non-self-employed firms help explain self-employment, but self-employment could help explain the number of firms. Controlling for this simultaneity would require an instrument that explains non-self-employed firms but does not have an independent effect on self-employment. Without a proper control, all coefficient estimates could be biased, but the bias will be most acute on the number of non-self-employed firms. Biases on other variables are probably insignificant. Due to this possible bias, this approach is not considered the baseline model nor is the coefficient on the number of non-self-employed firms in this model interpreted (an interpretation is unnecessary because this variable is only included as a control).

state (tax return measure) or population (employment measure). Table 2.3 presents these results, which indicate that higher top PIT rates and higher sales tax rates reduce the tax-based entrepreneurial share. Here, the effects are small; a one-percentage-point increase in the top PIT rate or sales tax rate will reduce a state's share of national entrepreneurship (for the tax return measure) by 0.8 percent or 1.4 percent respectively (based on an average entrepreneurial share of 2 percent). Statutory tax rates do not have a statistically distinguishable effect on a state's share of national entrepreneurship for the employment measure.

Similar to the earlier results regarding entrepreneurial stock, results identify a significant relationship between combined reporting requirements and the tax-based measure of entrepreneurial share. States with a combined reporting requirement tend to have tax-based entrepreneurial shares that are 0.05 percentage points (or 2.7 percent) higher than states without such a requirement. This result continues to hold when the number of firms in a state (excluding the self-employed) is held constant, again indicating more than a shift in organizational form. In a more significant deviation from the entrepreneurial stock specification, results indicate that states that have inheritance, estate, or gift taxes tend to have tax return entrepreneurial shares that are around 2.5 percent lower than states without such taxes. States that allow for LLCs tend to constitute a lower share of the national entrepreneurial stock than states without such an allowance. States with more tax incentives for economic development tend to have higher entrepreneurial shares. However, the effect is small; states with one additional tax incentive program are associated with national

entrepreneurial shares that are 0.3 percent or 0.15 percent higher for the tax return and employment based measures, respectively.

Regarding other control variables, the most striking result is that states with larger state governments, as measured by state taxes per capita, tend to have lower entrepreneurial shares. States with larger local governments tend to have lower employment based entrepreneurial shares. These findings are consistent with the notion that higher tax burdens (corresponding to more government spending) drive away firms. This finding stands in contrast to the reasoning that firms would be attracted to districts with larger governments due to relatively abundant public good provision. On the other hand, this result could simply be the result of crowding out. That is, states with larger governments hire more workers, reducing the pool of potential entrepreneurs. Similar to the entrepreneurial stock specification, estimates present seemingly conflicting results regarding poverty and median income. Higher poverty reduces a state's share of the national entrepreneurial stock, but higher median income reduces it as well (tax return measure only). In addition, higher unemployment increases entrepreneurial share (employment measure only).

Effects of State Tax Portfolios on Entrepreneurial Activity

The first two columns of Table 2.4 present a set of results where the state tax rate and other policy variables in Table 2.2 are replaced by state tax share variables for the CIT, PIT, sales tax, and business licenses. Entrepreneurial stock is the dependent variable in these regressions. Only one of the eight tax variable coefficients is statistically different from zero. The PIT share has a negative and

significant effect on the employment measure of entrepreneurship. Results for the non-tax variables are largely consistent with those in Table 2.2. One exception is that higher local taxes per capita are associated with higher rates of entrepreneurship, perhaps indicating that entrepreneurs are more likely to survive when local government lends more support to spending programs.

The two columns on the right of Table 2.4 present results from models that examine the effect of state tax portfolios on the state's share of the national entrepreneurial stock. Similar to the stock regressions, none of the tax shares are found to be statistically significant determinants of a state's share of the national entrepreneurial stock.

Robustness Checks

Effective Tax Rates. A common criticism in studies such as this that rely on top marginal tax rates is that not all entrepreneurs are taxed at the top rates. While marginal rates, and especially top marginal rates, are viewed as appropriate policy signals that might elicit entrepreneurial responses, it seems appropriate to investigate the sensitivity of the findings above to the use of a set of tax variables that more closely resemble effective rates. To this end, all of the baseline regressions are repeated after replacing the top marginal CIT and PIT rates and the sales tax rates with a set of three effective tax rates calculated as the ratio of tax revenue (for the CIT, PIT, and sales taxes) to state personal income. Also included are business licenses relative to state personal income as these fees may significantly hamper the

success of a small business.[47] Of course, state personal income is not the base of the CIT or business license taxes. However, these measures should serve as sufficient proxies for the true bases of these taxes to the extent that corporate profits are a fixed proportion of state personal income across states and time. Full results of these models are presented in Table 2.7.

The first two columns of this table present results from the models that use effective tax rates to explain entrepreneurial stock. The primary difference between the effects of effective and statutory tax rates is that the effective sales tax rate does not have a statistically significant effect on either measure of entrepreneurial stock. However, similar to Table 2.2, none of the other effective tax rates is found to have a statistically significant impact on either measure of entrepreneurial stock. Furthermore, all other tax policy results are largely unchanged from those in Table 2.2. The single exception is that an LLC allowance does not have a statistically significant effect on tax return based entrepreneurship. Results regarding non-tax controls are also similar.

Turning to entrepreneurial shares in the remaining two columns of Table 2.7, a state's effective PIT rate has a relatively large effect on a state's entrepreneurial share. A one percentage point increase in the effective PIT rate decreases entrepreneurial share by 4.9 percent (tax return measure) or 2.1 percent (employment measure). The effective sales tax rate is no longer a statistically significant determinant of tax based entrepreneurial share. Regarding the other tax controls, the

[47] This variable was not included in the baseline regressions since it is difficult to capture a "business license tax rate" when the format of these taxes varies widely across states.

only difference with examining effective rates is that states with larger homestead exemptions tend to have a larger share of the nation's entrepreneurs (tax return measure only). Results for non-tax controls are largely unchanged.

Agricultural Entrepreneurship. Another common concern in empirical studies of entrepreneurship and self-employment is whether to include entrepreneurs in the agricultural sector. For the baseline models above, the agricultural sector was excluded to parallel previous studies more closely. However, to investigate the sensitivity of these results to the inclusion of agricultural entrepreneurship, the above analysis was repeated with a consideration of agricultural entrepreneurship. Specific additions are (1) the inclusion of individuals who file a PIT return with farm income (Schedule F filers) as entrepreneurs for the tax-based measure, and (2) a consideration of the ratio of all sole proprietors to all workers instead of just non-farm equivalents for the employment measure. Full results for this exercise with tax policy variables are presented in Table 2.8.

A primary difference following the inclusion of agricultural entrepreneurs is that the sales tax no longer lowers entrepreneurial stock. In addition, tax and non-tax incentives do not affect entrepreneurial stocks after including agricultural entrepreneurs. A noticeable difference from these two specifications is that states with larger homestead exemptions and those with unlimited homestead exemptions have higher rates of employment-based entrepreneurship. In fact, states with an unlimited homestead exemption are associated with rates of entrepreneurship that are 2.6 percent higher than the state with the largest (finite) exemption amount. Regarding entrepreneurial shares, the inclusion of agricultural entrepreneurs renders

the coefficient of the top CIT rate significant and negative and the top PIT rate is no longer significant.

The inclusion of agricultural entrepreneurs in the entrepreneurial measures does not significantly change many of the results that were obtained without considering this group in the equations that study tax shares as explanatory variables, as opposed to statutory policy variables (see Table 2.9). The first difference with regards to tax shares is that the PIT tax share no longer reduces a state's entrepreneurial stock (employment measure only) with any degree of statistical precision. In addition, after including agricultural entrepreneurs, results indicate that states with higher license tax shares have higher entrepreneurial shares (tax return measure only). Results regarding other non-tax controls are similar.

2.E Conclusions

This study consists of an examination of state-level panel data for the period from 1989 through 2001 to better understand the relationship between state tax policies and entrepreneurship. Regression analysis indicates that statutory state sales, personal income, and corporate income tax rates do not have large effects on state rates of entrepreneurship or a state's share of the national entrepreneurial stock. These results are important to the debate on the design of optimal tax policy: there is no empirical evidence to suggest that altering statutory tax rates (or effective tax rates) for the purpose of encouraging entrepreneurship will be fruitful. On the other hand, if policymakers deem a tax rate increase necessary for reasons unrelated to

small business, these results do not provide evidence that the increase would likely have negative external consequences related to small business activity.

Results do indicate that other aspects of state tax policy can have important effects on observed measures of entrepreneurial activity. To recap some of the key findings, states with a combined reporting requirement have significantly higher rates of entrepreneurial stock and higher entrepreneurial shares in many instances. Similarly, states that have a throwback rule have higher rates of employment-based entrepreneurial stock. Estimates also show that states with more progressive PIT schedules have higher employment-based rates of entrepreneurship. Results also indicate that adding an additional tax incentive program for economic development increases entrepreneurial stock and share, but only by a small amount. This information is also worthy of consideration in the policymaking arena. If states value policies that promote entrepreneurship, the evidence suggests that combined reporting requirements and throwback rules have the largest effects.

This study is the first in the literature that has been identified to examine the effects of state tax portfolios on entrepreneurial activity. This study is especially important given concerns surrounding the effects of changing state revenue portfolios. However, results do not identify a strong relationship between relative reliance on a particular tax (sales, personal income, corporate income, or business license) and entrepreneurship. This should alleviate any concerns that moving from relative reliance on one tax to another (from the sales tax to the personal income tax for example) would have negative consequences on small business.

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Appendix

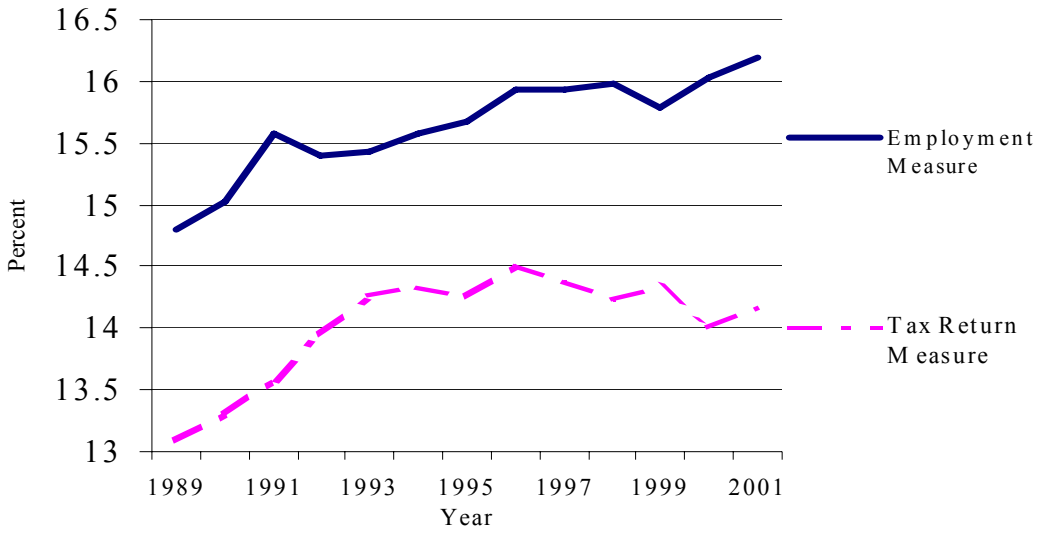

Figure 2.1: Average State Entrepreneurship Rates Over Time

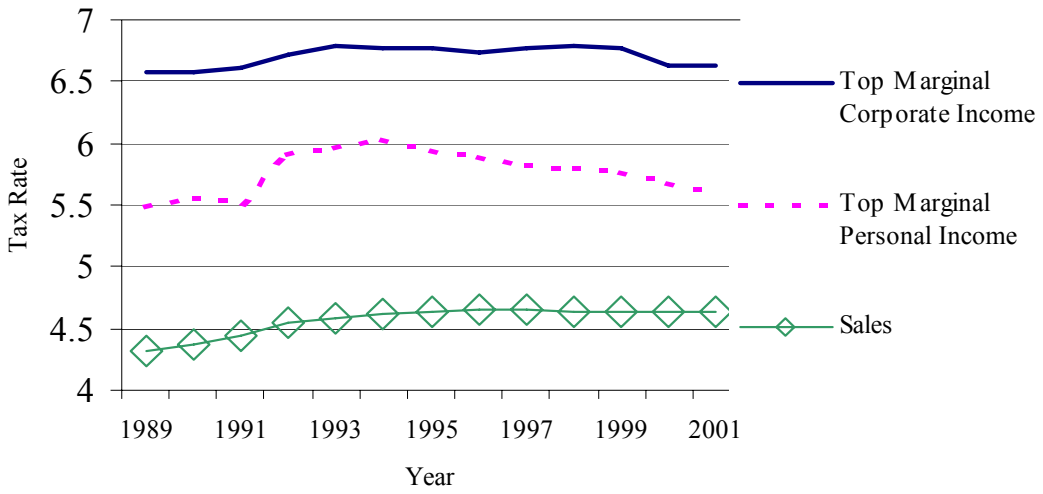

Figure 2.2: Average State Tax Rates Over Time

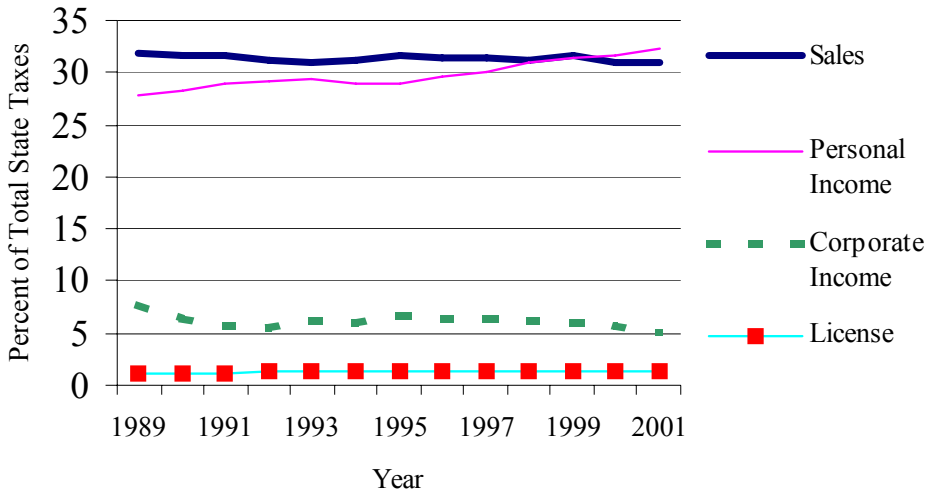

Figure 2.3: Average Tax Shares Over Time

Table 2.1: Entrepreneurship Rates and Shares by State

	Stock of Entrepreneurship				Share of Entrepreneurship			
	Tax Return Measure[1]		Employment Measure[2]		Tax Return Measure[3]		Employment Measure[4]	
	1989	2001	1989	2001	1989	2001	1989	2001
Alabama	11.3	13.4	12.1	14.3	1.3	1.4	1.3	1.3
Alaska	15.9	16.1	21.1	21.6	0.4	0.3	0.4	0.3
Arizona	13.2	13.3	15.7	16.3	1.5	1.6	1.6	1.8
Arkansas	14.0	15.0	15.7	15.7	1.0	0.9	1.0	0.9
California	14.8	16.1	16.1	19.6	14.2	13.4	14.0	14.7
Colorado	16.6	16.3	18.9	19.3	1.8	1.9	2.0	2.2
Connecticut	11.6	13.4	13.8	16.6	1.4	1.2	1.5	1.4
Delaware	9.5	10.5	10.8	12.4	0.2	0.2	0.2	0.2
Florida	12.6	14.2	14.0	15.6	5.4	6.0	4.9	5.4
Georgia	11.9	14.4	11.5	14.2	2.4	2.9	2.2	2.6
Hawaii	12.9	14.3	13.8	17.5	0.5	0.5	0.5	0.5
Idaho	16.6	16.9	19.6	20.0	0.5	0.5	0.5	0.6
Illinois	11.0	12.5	12.5	14.5	4.1	4.0	4.1	4.1
Indiana	11.6	12.3	12.4	14.0	2.1	1.9	1.9	1.9
Iowa	13.7	14.5	15.0	15.9	1.2	1.1	1.2	1.1
Kansas	14.7	14.6	16.6	16.2	1.1	1.0	1.2	1.1
Kentucky	13.1	14.0	13.1	14.0	1.4	1.4	1.2	1.2
Louisiana	12.5	13.5	13.4	14.5	1.5	1.4	1.4	1.3
Maine	15.5	17.2	16.8	19.8	0.6	0.6	0.6	0.6
Maryland	11.2	13.5	13.5	16.0	1.8	1.9	1.9	1.9
Massachusetts	12.1	13.8	12.2	15.4	2.5	2.4	2.4	2.5
Michigan	10.8	12.2	12.6	14.1	3.2	3.1	3.1	3.0
Minnesota	14.3	14.5	14.2	15.1	2.0	1.9	1.9	1.9
Mississippi	11.6	13.2	12.8	14.1	0.8	0.9	0.8	0.8
Missouri	12.9	13.7	13.6	15.2	2.1	1.9	2.0	2.0
Montana	17.0	18.0	21.1	22.6	0.4	0.4	0.4	0.5
Nebraska	13.9	14.6	15.0	15.5	0.7	0.6	0.7	0.7
Nevada	11.6	12.0	12.9	14.6	0.5	0.7	0.5	0.7
New Hampshire	14.3	14.9	16.2	18.3	0.6	0.5	0.6	0.6
New Jersey	10.3	12.0	12.6	14.2	2.8	2.7	2.9	2.6
New Mexico	13.8	15.5	17.0	16.7	0.6	0.7	0.7	0.6
New York	10.9	14.9	11.7	15.2	6.3	7.1	6.1	6.1
North Carolina	11.8	14.1	12.2	14.7	2.5	2.8	2.5	2.7
North Dakota	13.6	14.7	16.5	16.6	0.3	0.2	0.3	0.3
Ohio	10.9	11.7	12.3	13.8	3.9	3.6	3.8	3.6
Oklahoma	16.5	16.2	19.1	18.0	1.5	1.3	1.6	1.3
Oregon	14.8	15.1	17.3	18.4	1.3	1.3	1.4	1.4
Pennsylvania	10.7	11.7	13.2	14.4	4.2	3.8	4.4	3.8
Rhode Island	11.0	12.2	11.9	14.0	0.4	0.3	0.4	0.3
South Carolina	10.6	12.7	10.8	13.1	1.1	1.3	1.1	1.1
South Dakota	14.6	15.5	18.1	17.4	0.3	0.3	0.3	0.3
Tennessee	12.6	15.1	13.8	16.7	1.9	2.1	1.9	2.2
Texas	14.8	15.8	17.5	17.0	7.6	8.1	8.2	7.9
Utah	15.6	14.6	16.5	17.0	0.7	0.8	0.8	0.9
Vermont	16.4	17.9	18.3	20.5	0.3	0.3	0.3	0.3
Virginia	11.2	12.3	12.0	13.7	2.3	2.3	2.3	2.3
Washington	13.5	13.2	16.4	16.7	2.1	2.0	2.3	2.2
West Virginia	11.7	12.2	14.2	15.0	0.6	0.5	0.6	0.5
Wisconsin	11.1	11.6	12.3	13.2	1.8	1.7	1.7	1.7
Wyoming	16.0	16.2	19.8	20.1	0.2	0.2	0.3	0.2

1 Number of PIT returns with a Sch. C / Number of PIT returns.

2 Sole proprietor employment / Total employment.

3 Number of PIT returns with a Sch. C in state / Number of PIT returns with Sch. C in nation.

4 Sole proprietor employment in state / sole proprietor employment in nation.

Table 2.2: Fixed Effects Regressions: Entrepreneurial *Stock* and Statutory Tax Policy

Variable	Tax Return Measure	Employment Measure
Top Corporate Income Tax Rate	-0.055	-0.008
	(0.049)	(0.034)
Top Personal Income Tax Rate	0.075	-0.004
	(0.051)	(0.035)
Sales Tax Rate	0.165*	0.113*
	(0.098)	(0.068)
Sales Factor Apportionment	0.001	0.001
	(0.003)	(0.002)
Progressivity	0.248	0.505***
	(0.210)	(0.146)
Combined Reporting	0.673***	0.439***
	(0.181)	(0.126)
Throwback Rule	-0.112	0.280*
	(0.223)	(0.155)
Inheritance, Estate, and Gift	-0.111	-0.022
	(0.132)	(0.092)
LLC	0.185*	0.073
	(0.108)	(0.075)
Tax Incentives	0.030***	0.014*
	(0.011)	(0.008)
Non-Tax Incentives	0.016	-0.013*
	(0.010)	(0.007)
Homestead Exemption	-0.002	0.001
	(0.001)	(0.001)
Unlimited Homestead Exemption	0.026	0.035
	(0.283)	(0.198)
Unemployment Rate	0.078**	0.312***
	(0.039)	(0.027)
Median Income	-0.054***	-0.034***
	(0.015)	(0.010)
Poverty Rate	-0.020	-0.028**
	(0.015)	(0.011)
Population Density	0.011***	0.005*
	(0.004)	(0.003)
Job Growth Rate	0.007	0.090***
	(0.024)	(0.017)
Agricultural Share of GSP	0.064	0.125***
	(0.049)	(0.034)
Service Share of GSP	0.039	-0.027
	(0.044)	(0.031)
Manufacturing Share of GSP	-0.030	-0.051***
	(0.021)	(0.014)
State taxes per capita	-0.202	-0.154
	(0.178)	(0.124)
Local taxes per capita	0.502	0.331
	(0.333)	(0.232)
Constant	11.69***	13.77***
	(1.66)	(1.16)
R-squared	0.423	0.590

*, **, *** indicate statistical significance at the 10%, 5%, and 1% levels respectively.

Notes: Regressions include state and year fixed effects.

All percentages are on a 0-100 scale.

Median income, state and local taxes per capita, and homestead exemption are measured in thousands of current year dollars.

Table 2.3: Fixed Effects Regressions: Entrepreneurial *Share* and Statutory Tax Policy

Variable	Tax Return Measure	Employment Measure
Top Corporate Income Tax Rate	-0.004	0.0003
	(0.007)	(0.007)
Top Personal Income Tax Rate	-0.015**	-0.005
	(0.007)	(0.007)
Sales Tax Rate	-0.027**	-0.008
	(0.013)	(0.013)
Sales Factor Apportionment	-0.001**	-0.0003
	(0.0004)	(0.0004)
Progressivity	-0.017	-0.046
	(0.029)	(0.028)
Combined Reporting	0.053**	0.014
	(0.025)	(0.024)
Throwback Rule	-0.006	0.035
	(0.030)	(0.030)
Inheritance, Estate, and Gift	-0.050***	0.004
	(0.018)	(0.018)
LLC	-0.046***	-0.053***
	(0.015)	(0.015)
Tax Incentives	0.006***	0.003*
	(0.002)	(0.002)
Non-Tax Incentives	0.002	-0.010***
	(0.001)	(0.001)
Homestead Exemption	-0.0001	0.0002
	(0.0002)	(0.0002)
Unlimited Homestead Exemption	-0.011	-0.011
	(0.038)	(0.038)
Unemployment Rate	0.002	0.016***
	(0.005)	(0.005)
Median Income	-0.007***	-0.003
	(0.002)	(0.002)
Poverty Rate	-0.004**	-0.007***
	(0.002)	(0.002)
Population Density	0.001**	0.001
	(0.0005)	(0.001)
Job Growth Rate	0.002	0.002
	(0.003)	(0.003)
Agricultural Share of GSP	-0.009	-0.005
	(0.007)	(0.007)
Service Share of GSP	-0.015**	-0.003
	(0.006)	(0.006)
Manufacturing Share of GSP	-0.004	0.002
	(0.003)	(0.003)
State taxes per capita	-0.099***	-0.078***
	(0.024)	(0.024)
Local taxes per capita	0.002	-0.074*
	(0.045)	(0.045)
Number of PIT Returns	0.0002***	-
	(0.00003)	-
Population	-	0.0001***
	-	(0.00001)
Constant	2.33***	1.78***
	(0.23)	(0.22)
R-squared	0.797	0.933

*, **, *** indicate statistical significance at the 10%, 5%, and 1% levels respectively.

Notes: Regressions include state and year fixed effects.

All percentages are on a 0-100 scale.

Median income, state and local taxes per capita, and homestead exemption are measured in thousands of current year dollars.

Number of PIT Returns and population are in thousands.

Table 2.4: Fixed Effects Regressions: State Entrepreneurship and Tax Shares

	Entrepreneurial *Stock*		Entrepreneurial *Share*	
Variable	**Tax Return**	**Employment**	**Tax Return**	**Employment**
Corporate Income Tax Share	-0.023	-0.014	0.002	0.001
	(0.014)	(0.010)	(0.002)	(0.002)
Personal Income Tax Share	-0.011	-0.015*	-0.003	-0.003
	(0.013)	(0.009)	(0.002)	(0.002)
Sales Tax Share	-0.011	-0.012	-0.0003	0.0002
	(0.014)	(0.010)	(0.002)	(0.002)
License Tax Share	-0.007	-0.011	0.011	0.0004
	(0.050)	(0.035)	(0.007)	(0.007)
Unemployment Rate	0.059	0.285***	0.001	0.016***
	(0.039)	(0.027)	(0.005)	(0.006)
Median Income	-0.062***	-0.042***	-0.008***	-0.005**
	(0.014)	(0.010)	(0.002)	(0.002)
Poverty Rate	-0.018	-0.029***	-0.003	-0.006***
	(0.015)	(0.011)	(0.002)	(0.002)
Population Density	0.008**	0.005*	0.001	0.0002
	(0.004)	(0.003)	(0.001)	(0.001)
Job Growth Rate	0.007	0.083***	0.003	0.002
	(0.024)	(0.017)	(0.003)	(0.003)
Agricultural Share of GSP	0.038	0.117***	-0.010	-0.010
	(0.046)	(0.032)	(0.006)	(0.007)
Service Share of GSP	0.026	-0.028	-0.019***	-0.006
	(0.044)	(0.031)	(0.006)	(0.006)
Manufacturing Share of GSP	-0.032	-0.046***	-0.005*	-0.0002
	(0.021)	(0.014)	(0.003)	(0.003)
State Taxes per Capita	-0.158	-0.065	-0.060**	-0.026
	(0.176)	(0.123)	(0.024)	(0.025)
Local taxes per Capita	1.013***	0.526**	0.098**	-0.109**
	(0.322)	(0.225)	(0.045)	(0.046)
Number of PIT Returns	-	-	0.0002***	-
	-	-	(0.00003)	-
Population	-	-	-	0.0001***
	-	-	-	(0.00001)
Constant	14.43***	15.95***	10.93***	1.89***
	(1.52)	(1.06)	(0.210)	(0.216)
R-squared	0.392	0.568	0.888	0.950

*, **, *** indicate statistical significance at the 10%, 5%, and 1% levels respectively.

Notes: Regressions include state and year fixed effects.

All percentages are on a 0-100 scale.

Median income, state taxes per capita, and local taxes per capita are measured in thousands of current year dollars.

Number of PIT returns and population are in thousands.

Table 2.5: Summary Statistics

	1989		2001	
Variable	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**
Schedule C Returns/Total Returns	13.10	2.00	14.17	1.73
Nonfarm Sole Prop. Emp./Total Nonfarm Emp.	14.81	2.75	16.19	2.35
Sch. C + Sch. F Returns/Total Returns	15.93	4.17	16.55	3.31
Sole Proprietor Emp./Total Emp.	16.72	3.69	17.64	2.80
Share Schedule C Returns	2.00	2.36	2.00	2.35
Share Proprietor Employment	2.00	2.36	2.00	2.24
Top Corporate Income Tax Rate	6.58	3.01	6.63	2.91
Top Personal Income Tax Rate	5.47	3.37	5.59	3.22
Sales Tax Rate	4.32	1.75	4.63	1.81
Corporate Income Tax Share	7.89	5.66	5.17	4.60
Personal Income Tax Share	27.73	15.87	32.41	17.93
Sales Tax Share	31.79	14.68	31.06	14.82
License Tax Share	1.18	2.72	1.37	4.09
Corporate Income Revenue/SPI	0.53	0.55	0.35	0.31
Personal Income Tax Revenue/SPI	1.81	1.04	2.30	1.24
Sales Tax Revenue/SPI	2.05	0.99	2.15	1.05
License Tax Revenue/SPI	0.08	0.21	0.10	0.34
Sales Factor Apportionment	36.71	15.21	43.22	22.56
Progressivity	0.50	0.46	0.24	0.24
Combined Reporting	0.22	0.42	0.28	0.45
Throwback Rule	0.48	0.50	0.46	0.50
Inheritance, Estate, and Gift Tax	0.50	0.51	0.26	0.44
LLC	0.04	0.20	1.00	0.00
Tax Incentives	10.47	1.82	8.61	6.13
Non-tax Incentives	5.49	2.09	12.56	7.99
Homestead Exemption (thousands)	50.0	54.9	73.2	68.2
Homestead Exemption Unlimited	0.16	0.37	0.12	0.33
Unemployment Rate	5.15	1.35	4.53	0.87
Median Income (thousands)	39.57	5.58	62.04	9.04
Poverty Rate	12.55	3.93	11.23	3.31
Population Density	165.3	234.7	184.0	252.9
Job Growth Rate (excluding farming)	2.31	1.37	-0.19	1.08
Job Growth Rate (including farming)	2.15	1.34	-0.21	1.05
Agricultural Share of GSP	2.85	2.56	1.91	1.40
Service Share of GSP	16.64	3.74	20.43	3.48
Manufacturing Share of GSP	18.44	7.47	14.30	5.72
State taxes per capita (thousands)	1.15	0.33	1.94	0.40
Local taxes per capita (thousands)	0.66	0.26	1.07	0.36

Note: All percentages are on a 0-100 scale.

Median income, state and local taxes per capita, and homestead exemption and measured in thousands of current year dollars.

Table 2.6: Data Descriptions and Source Notes

Variable	Definition
Schedule C Returns/Total Returns	Federal tax returns with a schedule C as a share of total tax returns, by state. (1)
Sch. C + Sch. F Returns/Total Returns	Federal tax returns with a schedule C or F as a share of total tax returns, by state.(1)
Nonfarm Sole Prop. Emp./Total Nfarm Emp.	Nonfarm sole prop. employment as a share of total nonfarm employment in a state. (2)
Sole Proprietor Emp./Total Emp.	Sole proprietership employment as a share of total employment in a state. (2)
Top Corporate Income Tax Rate	Highest marginal corporate income tax rate. (3)
Top Personal Income Tax Rate	Highest marginal personal income tax rate. (3)
Sales Tax Rate	General sales tax rate. (3)
Corporate Income Tax Share	Corporate income tax collections as a share of total tax collections in a state. (4)
Personal Income Tax Share	Personal income tax collections as a share of total tax collections in a state. (4)
Sales Tax Share	Sales tax collections as a share of total tax collections in a state. (4)
License Tax Share	Corporate license and fee collections as a share of total tax collections in a state. (4)
Corporate Income Revenue/SPI	Corporate income tax collections as a share of state personal income. (5)
Sales Tax Revenue/SPI	Sales tax collections as a share of state personal income. (5)
License Tax Revenue/SPI	Corporate license and fee collections as a share of state personal income. (5)
Sales Factor Apportionment	Weight given to sales factor in the corporate income tax apportionment formula. (3)
Progressivity	Change in avg. tax rate relative to $20,000 change in income. (Scaled by 10,000.) (6)
Combined Reporting	1 if a state has a combined reporting requirement. (3)
Throwback Rule	1 if a state has a throwback rule. (15)
Inheritance, Estate, and Gift Tax	1 if a state has an inheritance, estate, or gift tax. (13)
LLC	1 if a state allows LLCs. (7)
Tax Incentives	Number of tax incentive programs a state offers. (14)
Non-Tax Incentives	Number of non-tax incentive programs a state offers. (14)
Homestead Exemption	Dollar amount of home equity that is exempt from bankruptcy. (12)
Homestead Exemption Unlimited	1 if a state has an unlimited homestead exemption. (12)
Unemployment Rate	State unemployment rate. (8)
Median Income (thousands)	State median income. (8)
Poverty Rate	Percent of state population living below poverty line. (8)
Population Density	Population/square miles in a state. (9)
Job Growth Rate (excluding farming)	Growth rate in non-farm employment over previous year. (10)
Job Growth Rate (including farming)	Growth rate in total employement over previous year. (10)
Agricultural Share of GSP	State agricultural producation as a share of total gross state product. (10)
Service Share of GSP	State service producation as a share of total gross state product. (10)
Manufacturing Share of GSP	State manufacturing producation as a share of total gross state product. (10)
State taxes per capita (thousands)	Total state tax collections per person. (11)
Local taxes per capita (thousands)	Total local tax collections in a state per person. (11)
Number of non self-employed firms.	Count of the number of firms in a state (excluding the self-employed). (16)

Table 2.6 (continued): Data Descriptions and Source Notes

Notes:

1. Author's calculations based on data from *Statistics of Income Bulletin* , Internal Revenue Service, various years.
2. *Regional Economic Accounts* , Bureau of Economic Analysis, various years.
3. *State Tax Handbook* , Commerce Clearing House, various years.
4. Author's calculations based on data from *State Government Tax Collections* , U.S. Census Bureau, various years.
5. Author's calculations based on data listed in note 4 (tax collections) and note 8 (state personal income).
6. Author's calculations based on data listed in note 8 (median income) and note 3 (tax rates).
7. www.llcweb.com
8. *Statistical Abstract of the United States* , U.S. Census Bureau, various years.
9. Author's calculations based on data from data listed in note 8.
10. Author's calculations based on data from *Regional Accounts Data,* Bureau of Economic Analysis, various years.
11. Author's calculations based on data from note 4 (tax collections) and note 8 (population).
12. Elias, Renauer, and Leonard, various years.
13. Conway and Rork, 2003.
14. National Association of State Development Agencies, various years.
15. *State Tax Handbook* , Commerce Clearing House (various years) and various state revenue departments.
16. *Statistics of U.S. Businesses* , U.S. Census Bureau, various years.

Table 2.7: Fixed Effects Results: State Entrepreneurship and *Effective* Tax Rates

	Entrepreneurial Stock		Entrepreneurial Share	
Variable	**Tax Return**	**Employment**	**Tax Return**	**Employment**
Corporate Income Revenue/SPI	-0.066	0.084	0.026	0.026
	(0.140)	(0.097)	(0.018)	(0.019)
Personal Income Tax Revenue/SPI	-0.047	-0.005	-0.098***	-0.042**
	(0.156)	(0.108)	(0.021)	(0.021)
Sales Tax Revenue/SPI	0.132	-0.043	-0.010	-0.006
	(0.172)	(0.119)	(0.023)	(0.023)
License Tax Revnenue/SPI	-0.156	0.101	0.086	0.01
	(0.574)	(0.399)	(0.076)	(0.076)
Sales Factor Apportionment	0.001	0.001	-0.001***	-0.0004
	(0.003)	(0.002)	(0.0004)	(0.0004)
Progressivity	0.333	0.550***	-0.023	-0.044
	(0.207)	(0.144)	(0.027)	(0.028)
Combined Reporting	0.657***	0.428***	0.055**	0.014
	(0.181)	(0.126)	(0.024)	(0.024)
Throwback Rule	-0.135	0.276*	-0.009	0.035
	(0.223)	(0.155)	(0.030)	(0.030)
Inheritance, Estate, and Gift	-0.129	-0.050	-0.044**	0.004
	(0.133)	(0.092)	(0.018)	(0.018)
LLC	0.172	0.070	-0.040***	-0.049***
	(0.109)	(0.076)	(0.014)	(0.015)
Tax Incentives	0.029***	0.012	0.009***	0.004**
	(0.011)	(0.008)	(0.001)	(0.002)
Non-Tax Incentives	0.012	-0.014**	0.002	-0.010***
	(0.010)	(0.007)	(0.001)	(0.001)
Homestead Exemption	0.002	0.001	0.0004**	0.0003
	(0.001)	(0.001)	(0.0002)	(0.0002)
Unlimited Homestead Exemption	0.039	0.029	-0.005	-0.009
	(0.286)	(0.198)	(0.038)	(0.038)
Unemployment Rate	0.081**	0.309***	0.001	0.016***
	(0.039)	(0.027)	(0.005)	(0.005)
Median Income	-0.053***	-0.034***	0.006***	-0.002
	(0.015)	(0.010)	(0.002)	(0.002)
Poverty Rate	-0.016	-0.029***	-0.004*	-0.006***
	(0.016)	(0.011)	(0.002)	(0.002)
Population Density	0.010**	0.005*	0.001*	0.0005
	(0.004)	(0.003)	(0.001)	(0.001)
Job Growth Rate	0.008	0.089***	0.003	0.002
	(0.024)	(0.017)	(0.003)	(0.003)
Agricultural Share of GSP	0.072	0.122***	-0.009	-0.005
	(0.049)	(0.034)	(0.007)	(0.007)
Service Share of GSP	0.039	-0.030	-0.012*	-0.002
	(0.045)	(0.032)	(0.006)	(0.006)
Manufacturing Share of GSP	-0.037*	-0.054***	-0.001	0.002
	(0.021)	(0.015)	(0.003)	(0.003)
State Taxes per Capita	-0.127	-0.190	-0.077	-0.077**
	(0.228)	(0.158)	(0.030)	(0.030)
Local taxes per Capita	0.500	0.211	0.026**	-0.071
	(0.331)	(0.230)	(0.044)	(0.044)
Number of PIT Returns	-	-	0.0002***	-
	-	-	(0.00002)	-
Population	-	-	-	0.0001***
	-	-	-	(0.00001)
Constant	12.30***	14.57***	2.04***	1.71***
	(1.55)	(1.08)	(0.21)	(0.21)
R-squared	0.419	0.589	0.832	0.937

*, **, *** indicate statistical significance at the 10%, 5%, and 1% levels respectively.

Notes: Regressions include state and year fixed effects.

All percentages are on a 0-100 scale.

Median income, state and local taxes per capita, and homestead exemption are measured in thousands of current year dollars.

Number of PIT returns and population are in thousands.

Table 2.8: Fixed Effects Results: Statutory Tax Policy with Agricultural Ent.

	Entrepreneurial Stock		Entrepreneurial Share	
Variable	**Tax Return**	**Employment**	**Tax Return**	**Employment**
Top Corporate Income Tax Rate	-0.078	-0.028	-0.011*	-0.005
	(0.057)	(0.037)	(0.006)	(0.006)
Top Personal Income Tax Rate	0.086	-0.013	-0.008	-0.004
	(0.059)	(0.038)	(0.006)	(0.006)
Sales Tax Rate	0.151	0.077	-0.036***	-0.016
	(0.114)	(0.073)	(0.012)	(0.012)
Sales Factor Apportionment	0.002	0.002	-0.0004	-0.0002
	(0.003)	(0.002)	(0.0003)	(0.0003)
Progressivity	0.266	0.481***	-0.03	-0.052**
	(0.244)	(0.157)	(0.026)	(0.025)
Combined Reporting	0.469**	0.327**	0.050**	0.020
	(0.209)	(0.135)	(0.023)	(0.021)
Throwback Rule	-0.053	0.234	0.007	0.037
	(0.258)	(0.167)	(0.028)	(0.026)
Inheritance, Estate, and Gift	-0.093	-0.039	-0.046***	-0.0002
	(0.153)	(0.099)	(0.017)	(0.016)
LLC	0.175	0.070	-0.049***	-0.044***
	(0.125)	(0.081)	(0.014)	(0.013)
Tax Incentives	0.033**	0.012	0.005***	0.002
	(0.013)	(0.008)	(0.001)	(0.001)
Non-Tax Incentives	0.016	-0.007	0.001	-0.008***
	(0.011)	(0.007)	(0.001)	(0.001)
Homestead Exemption	-0.0005	0.002**	0.0002	0.0002
	(0.002)	(0.001)	(0.0002)	(0.0002)
Unlimited Homestead Exemption	0.481	0.450**	0.017	0.022
	(0.328)	(0.212)	(0.036)	(0.034)
Unemployment Rate	0.069	0.309***	0.004	0.016***
	(0.045)	(0.029)	(0.005)	(0.005)
Median Income	-0.078***	-0.034***	-0.009***	-0.003*
	(0.017)	(0.011)	(0.002)	(0.002)
Poverty Rate	-0.020	-0.014	-0.003*	-0.004**
	(0.018)	(0.012)	(0.002)	(0.002)
Population Density	0.015***	0.008***	0.002***	0.001
	(0.005)	(0.003)	(0.001)	(0.0005)
Job Growth Rate	-0.001	0.098***	0.003	0.005*
	(0.029)	(0.018)	(0.003)	(0.003)
Agricultural Share of GSP	0.328***	0.277***	0.004	0.003
	(0.057)	(0.037)	(0.006)	(0.006)
Service Share of GSP	0.057	-0.029	-0.012**	-0.003
	(0.051)	(0.033)	(0.006)	(0.005)
Manufacturing Share of GSP	-0.037	-0.058***	-0.003	0.003
	(0.024)	(0.016)	(0.003)	(0.002)
State Taxes per Capita	-0.318	-0.244*	-0.104***	-0.069***
	(0.206)	(0.133)	(0.022)	(0.021)
Local taxes per Capita	0.321	0.301	-0.006	-0.061
	(0.385)	(0.249)	(0.042)	(0.040)
Number of PIT returns	-	-	0.0003***	-
	-	-	(0.00002)	-
Population	-	-	-	0.0001***
	-	-	-	(0.00001)
Constant	14.12***	15.07***	2.14***	1.54***
	(1.92)	(1.24)	(0.21)	(0.020)
R-squared	0.367	0.480	0.768	0.926

*, **, *** indicate statistical significance at the 10%, 5%, and 1% levels respectively.

Notes: Regressions include fixed year effects.

All percentages are on a 0-100 scale.

Median income, state and local taxes per capita, and homestead exemption are measured in thousands of current year dollars.

Number of PIT returns and population are in thousands.

Table 2.9: Fixed Effects Results: Tax Shares with Agricultural Entrepreneurship

	Entrepreneurial Stock		Entrepreneurial Share	
Variable	**Tax Return**	**Employment**	**Tax Return**	**Employment**
Corporate Income Tax Share	-0.023	-0.012	0.001	0.001
	(0.017)	(0.011)	(0.002)	(0.002)
Personal Income Tax Share	0.008	-0.009	-0.002	-0.002
	(0.015)	(0.010)	(0.002)	(0.002)
Sales Tax Share	-0.003	-0.015	-0.0003	-0.0002
	(0.016)	(0.010)	(0.002)	(0.002)
License Tax Share	0.013	-0.020	0.017***	-0.0003
	(0.057)	(0.037)	(0.006)	(0.006)
Unemployment Rate	0.053	0.284***	0.004	0.016***
	(0.045)	(0.029)	(0.005)	(0.005)
Median Income	-0.091***	-0.046***	-0.010***	0.005***
	(0.016)	(0.011)	(0.002)	(0.002)
Poverty Rate	-0.017	-0.013	-0.002	-0.003*
	(0.018)	(0.012)	(0.002)	(0.002)
Population Density	0.013***	0.009***	0.001*	0.001
	(0.005)	(0.003)	(0.0005)	(0.001)
Job Growth Rate	0.003	0.095***	0.005	0.006*
	(0.029)	(0.019)	(0.003)	(0.003)
Agricultural Share of GSP	0.330***	0.287***	0.005	-0.001
	(0.053)	(0.034)	(0.006)	(0.006)
Service Share of GSP	0.038	-0.035	-0.014**	-0.004
	(0.051)	(0.033)	(0.006)	(0.006)
Manufacturing Share of GSP	-0.044*	-0.055***	-0.003	0.002
	(0.024)	(0.015)	(0.003)	(0.003)
State Taxes per Capita	-0.296	-0.191	-0.067***	-0.026
	(0.203)	(0.132)	(0.023)	(0.022)
Local taxes per Capita	0.689*	0.438*	0.085**	-0.089**
	(0.371)	(0.241)	(0.042)	(0.041)
Number of Tax returns	-	-	0.0002***	-
	-	-	(0.00002)	-
Population	-	-	-	0.0001***
	-	-	-	(0.00001)
Constant	16.46***	17.03***	2.03***	1.56***
	(1.74)	(1.13)	(0.20)	(0.19)
R-squared	0.343	0.453	0.839	0.933

*, **, *** indicate statistical significance at the 10%, 5%, and 1% levels respectively.

Notes: Regressions include fixed year effects.

All percentages are on a 0-100 scale.

Median income, and state and local taxes per capita are measured in thousands of current year dollars.

Number of PIT returns and population are in thousands.

Table 2.10: Fixed Effects Results: Controlling for Non-Self-Employed Firms

	Entrepreneurial Stock		Entrepreneurial Share	
Variable	Tax Return	Employment	Tax Return	Employment
Top Corporate Income Tax Rate	-0.054	-0.008	-0.005	0.0003
	(0.049)	(0.034)	(0.007)	(0.007)
Top Personal Income Tax Rate	0.051	-0.020	-0.012	-0.005
	(0.052)	(0.036)	(0.007)	(0.007)
Sales Tax Rate	0.164*	0.112*	-0.025*	-0.008
	(0.098)	(0.068)	(0.013)	(0.013)
Sales Factor Apportionment	0.002	0.002	-0.001**	-0.0003
	(0.003)	(0.002)	(0.0004)	(0.0004)
Progressivity	0.288	0.534***	-0.021	-0.046
	(0.211)	(0.147)	(0.029)	(0.029)
Combined Reporting	0.634***	0.412***	0.059**	0.014
	(0.181)	(0.126)	(0.024)	(0.024)
Throwback Rule	-0.067	0.312**	-0.019	0.035
	(0.223)	(0.155)	(0.030)	(0.030)
Inheritance, Estate, and Gift	-0.110	-0.022	-0.046**	0.004
	(0.132)	(0.092)	(0.018)	(0.018)
LLC	0.165	0.059	-0.044***	-0.053***
	(0.108)	(0.076)	(0.015)	(0.015)
Tax Incentives	0.031***	0.014*	0.007***	0.003*
	(0.011)	(0.008)	(0.002)	(0.002)
Non-Tax Incentives	0.015	-0.013*	0.002	-0.010***
	(0.010)	(0.007)	(0.001)	(0.001)
Homestead Exemption	0.002	0.001	0.0002	0.0002
	(0.001)	(0.001)	(0.0002)	(0.0002)
Unlimited Homestead Exemption	0.002	0.017	-0.001	-0.011
	(0.283)	(0.197)	(0.038)	(0.038)
Unemployment Rate	0.067*	0.304***	0.002	0.016***
	(0.040)	(0.028)	(0.005)	(0.005)
Median Income	-0.055***	-0.035***	-0.007***	-0.003
	(0.015)	(0.010)	(0.002)	(0.002)
Poverty Rate	-0.021	-0.028***	-0.005**	-0.007***
	(0.015)	(0.011)	(0.002)	(0.002)
Population Density	0.013***	0.007**	0.001*	0.001
	(0.004)	(0.003)	(0.0005)	(0.001)
Job Growth Rate	0.007	0.090***	0.002	0.002
	(0.024)	(0.017)	(0.003)	(0.003)
Agricultural Share of GSP	0.071	0.129***	-0.009	-0.005
	(0.049)	(0.034)	(0.007)	(0.007)
Service Share of GSP	0.055	-0.015	-0.017***	-0.003
	(0.045)	(0.031)	(0.006)	(0.006)
Manufacturing Share of GSP	-0.026	-0.048***	-0.005*	0.002
	(0.021)	(0.014)	(0.003)	(0.003)
State Taxes per Capita	-0.171	-0.132	-0.100***	-0.078***
	(0.179)	(0.124)	(0.024)	(0.024)
Local taxes per Capita	0.570*	0.378	-0.002	-0.074*
	(0.334)	(0.232)	(0.045)	(0.045)
Number of Firms	-0.010*	-0.007**	0.004***	-0.000002
	(0.005)	(0.004)	(0.001)	(0.001)
Number of PIT returns	-	-	0.0001	-
	-	-	(0.0001)	-
Population	-	-	-	0.0001***
	-	-	-	(0.00002)
Constant	12.01***	14.06***	2.27***	1.78***
	(1.67)	(1.16)	(0.23)	(0.23)
R-squared	0.426	0.593	0.887	0.933

*, **, *** indicate statistical significance at the 10%, 5%, and 1% levels respectively.

Notes: Regressions include fixed year effects.

All percentages are on a 0-100 scale.

Median income, state and local taxes per capita, and homestead exemption are measured in thousands of current year dollars.

Number of PIT returns, population, and Number of Firms are in thousands.

Part 4

Essay Three:

Tax Evasion and Self-Employment: An Experimental Analysis of the Effect of Income Reporting Policies on Evasion

3.A Introduction

The methods by which income is reported to the tax authority vary significantly across types of employment in the United States. One such difference is the requirement that employers must report their employees' income to the taxing authority - referred to herein as a matched income arrangement – while often the income of self-employed individuals is not reported by a third party (referred to, correspondingly, as non-matched income). This lack of secondary income reporting among self-employed individuals may decrease the likelihood that tax evasion among this group would be detected. Therefore, self-employed individuals would face a lower effective tax rate in a simple rational tax evasion model, all else equal, which would increase the relative return to self-employment and, perhaps inefficiently, increase the number of self-employed individuals.[48]

The alleged tax evasion among the self-employed provides significant motivation for an examination into the specific reasons that this group exhibits different tax compliance behavior, one of the foremost reasons being the lack of matched income reporting in this sector. The idea that the self-employed have different income tax compliance behavior is longstanding in the literature.[49] The empirical literature has also supported the idea that evasion partially motivates the transition between self-employment and wage and salary employment.

[48] See Allingham and Sandmo (1972) and Yitzhaki (1974) for seminal contributions to tax evasion models.

[49] See Andreoni, Erard, and Feinstein (1998, p. 821) who cite 1988 statistics from the Taxpayer Compliance Measurement Program, which indicate that the average tax understatement for individuals with farm and sole-proprietor income (which are not subject to reporting requirements) are $1,058 and $827, respectively. This compares to an average overall understatement of $289.

Bruce (2000) provides suggestive evidence that individuals enter into self-employment to exploit the tax evasion opportunities therewith associated. Despite the large literature, no studies have been identified that use experimental economics methods to address the tax compliance behavior of the self-employed.

In this study, an experiment is designed to test whether individuals exhibit different tax compliance patterns as they earn different shares of income that is perfectly detectable upon audit and income that cannot be detected with certainty. This situation could arise in the naturally occurring environment when only a subset of income is reported to the tax authority by an external party, such as is the case when some individuals earn wages and salaries while others are self-employed. The methods employed below also allow for an examination of the effects of tax rates, audit rates, gross income, and other factors on tax compliance behavior. This information is relevant to policy questions that surround the design of optimal income tax reporting and auditing systems and whether government should engineer tax policy to favor movement into self-employment. This study adds to the literature on the tax compliance behavior of the self-employed in that the experimental design isolates one of several reasons that the self-employed comply differently.

Experimental methods provide several advantages in examining patterns of evasion across groups who face different probabilities that their income will be detected by the tax authority. Most importantly, an appropriately designed experiment will allow for a better isolation and control of the fundamental influences arising from variations in the probabilities that wage and salary employment and self-employment income will be detected upon audit, relative to naturally occurring data.

In addition, fully accurate naturally occurring data are nearly impossible to obtain regarding tax evasion due to the nature of the issue. Specifically, individuals intentionally hide evasion in many cases. Experimental methods prove advantageous on this dimension in that data on compliance rates and control variables are fully accurate. Of course, experiments give rise to a host of different shortcomings. For example, data are drawn from somewhat artificial laboratory environments that use student subjects. Thus, experimental analysis should be interpreted as another mode of inquiry, not as the only appropriate method.

This paper is organized as follows. Section 3.B provides a review of the relevant literature. Section 3.C explains the experimental design. Section 3.D presents the hypotheses tested. Section 3.E contains a review of the analytical technique used. Section 3.F presents and discusses the results, and Section 3.E concludes. Results indicate that individuals who earn relatively more non-matched income exhibit significantly lower tax compliance rates than individuals who earn relatively less non-matched income. Other results are consistent with the literature. In particular, results indicate that higher income levels, higher tax rates, and lower audit rates lead to increased tax evasion.

3.B Existing Literature

Several studies have examined naturally occurring data to assess the different tax compliance patterns among the self-employed, which, of course, is in part due to the less than perfect detectability of some self-employment income, arising from a

lack of third party reporting, and are thus relevant to the current study.[50] This difficulty of detecting income that is not subject to third party reporting is described by Joulfaian and Rider (1998, p. 675):

> In large part, this disparity in reporting compliance is attributed to the lower probability of detecting unreported self-employment income; or conversely stated, the higher cost of detecting unreported self-employment income due to the absence of third-party reporting of income and income tax withholding. In contrast, we observe nearly complete reporting of wage income that is subject to third-party reporting and withholding.

The differing compliance behavior between self-employed individuals and individuals in wage and salary employment has been considered for years. Indeed, in a recent review of the literature on taxation and self-employment, Scheutze and Bruce (forthcoming) conclude that tax non-compliance among the self-employed is a significant concern. To support this claim, they cite research that finds this sector of the economy makes a very significant contribution to the total level of tax evasion in the nation. One of the studies in their review (U.S. General Accounting Office, 1990) estimates that, for 1987, self-employed individuals account for 63 percent of the $48 billion in unreported income. Furthermore, Kagan (1989) reports findings from an IRS study of tax returns (IRS, 1983) that estimates that only 50.3 percent of nonfarm proprietor income is voluntarily reported to the IRS compared to 93.9 percent of wage and salary income for 1979. Kagan goes on to discuss another IRS study that examined individuals who were treated as independent contractors (and had no income reported or withheld by a third party). The study found a low percentage of

[50] Other reasons for non-compliance in this sector could be a lack of income withholding or simply a misunderstanding of the tax system which could stem from less access to paid professional tax planners.

income reported overall and that 47 percent of the independent contractors did not report any of their earnings. Feinstein (1991, p. 15) concludes, after analyzing data from IRS's Taxpayer Compliance Measurement Program, "Schedule C (own business) and F (farm) filers are much more likely to evade than the average taxpayer."[51]

In addition, the empirical literature has found suggestive evidence that individuals enter into self-employment to take advantage of non-compliance opportunities. More specifically, the common finding that higher tax rates lead to more self-employment is generally explained by the idea that higher tax rates drive individuals into self-employment to take advantage of the associated evasion opportunities.[52] Recently, Bruce (2000) finds that higher tax rates, as well as the differential between the marginal tax rates on wage and salary and self-employment, both increase self-employment. He asserts that a likely explanation for this result is that individuals may enter into self-employment to exploit the opportunities to evade taxes.

Despite this large literature, clear conclusions regarding the determinants and magnitude of tax evasion among the self-employed are still elusive. Of primary importance is a lack of fully reliable naturally occurring data given that evasion is

[51] See also Witte and Woodbury (1985). The authors found, using IRS tax return data from the early 1970s, that tax compliance rates are higher in areas where relative more individuals are employed in the manufacturing sector (where individuals presumably earn relatively more wage and salary income), all else equal. They interpret this finding as evidence that relatively more income that is reported by a third-party, and is therefore more easily detectable, leads to relatively higher compliance rates.
[52] See Blau (1987) for a classic example. Also see Robson and Wren (1999), who examine the issue more closely by distinguishing between the effects of marginal and average tax rates on self-employment, arguing that the latter are related to evasion.

difficult to capture for several reasons, especially because many taxpayers who underreport intentionally attempt to hide income so as not to be caught.[53] Numerous other confounding effects with naturally occurring data also make clear estimates of tax non-compliance difficult to obtain such as ambiguous tax laws regarding deductions and non-filers (who are often difficult to capture in a data set). Experimental data offer significant advantages over both of these issues as compliance rates from experiments are accurate and each variable that affects compliance can be controlled for. A third gap in studies using naturally occurring data is that they have been unable to differentiate between the various causes that may encourage the self-employed to evade more. Such an isolation of specific influences on compliance is very difficult (if not impossible) using existing naturally occurring data. In the experimental design below, this problem is overcome by specifically isolating the lower detectability that may accompany self-employment income.[54]

3.C Experimental Design

The experimental structure created in this study attempts to replicate the fundamental elements of the income tax in the United States that include the

[53] Clotfelter (1983, p.367) states, in reference to data from the Taxpayer Compliance Measurement Program, "…income from moonlighting and cash-only businesses is very difficult even for trained auditors to identify."

[54] See also Madeo, Schepanski, and Uecker (1987). The authors recruited a pool of 71 CPAs and presented them with a series of cases involving hypothetical taxpayers. Each case involved four factors, one of which was the source of income for the hypothetical taxpayer. The subjects then chose how much income that would be reported by the "typical" taxpayer. The authors found that their subjects predicted that those (hypothetical) individuals who earned significantly more self-employment income would likely evade more.

following steps.[55] First, subjects earn income by performing a simple task. Then they report some or all of it to the taxing authority and pay taxes on the amount reported. Next, an audit is randomly determined with some known probability. If a subject is audited, whether unreported income is detected is randomly determined, also with a known probability. Finally, if an individual is not in compliance and is detected, he or she pays additional taxes owed plus a penalty.

The success of this study hinges on whether this setting provides for the necessary degree of "parallelism" to the naturally occurring world that is crucial to the applicability of any policy oriented experimental result (Smith, 1982). More specifically, while the experimental setting need not attempt to capture all of the variation in the naturally occurring environment, it should sufficiently recreate the fundamental elements of the naturally occurring world if the results are to be worthy of consideration in policy debates. It should be noted that this experimental design uses non-neutral language (i.e., tax language) to better capture the naturally occurring environment.

The experiment proceeds in the following fashion. Each subject sits at a laptop computer in a cubicle and is not allowed to communicate with other subjects. This arrangement eliminates any potential peer effects that could blur the conclusions of the study. All actions that subjects take are made on their computer. Subjects initially earn income based upon their performance in a simple computerized task. More specifically, they are required to move numbers in the correct order from one

[55] The basic experimental design and platform in this study is similar to that of Alm, Jackson, and McKee (2004). The difference is the incorporation of matched versus non-matched income. This design is similar to that in the seminal work of Alm, Jackson, and McKee (1992).

location on the computer screen to another location.[56] The subject who finishes the task with the quickest time earns the highest income, 100 "lab dollars." The second and third place finishers earn 90 lab dollars each, the fourth and fifth place finishers earn 80 lab dollars each, and so on. Ties are randomly broken. Subjects are informed of their earnings relative to those other participants in their experiment. This is the only knowledge subjects have of other participants.

After earning income, subjects see a screen that reports their income as well as the income of the other participants.[57] This screen also presents all other relevant parameters that subjects need in their decision making process. These include the audit rate, the tax rate, the percentage of income that is matchable, the penalty rate on unreported income, and the probability of being detected if they fail to report all of their non-matched income. Subjects then choose how much of their matched and non-matched income to report to the tax authority.[58] They are told that they are obligated to report all of their income, but it is ultimately their decision.[59] They are able to report any amount between zero and their total earnings (no decimals) of each type of income. The computer automatically reports taxes owed. It also computes tax liability based on the fractions of matched and non-matched income reported. Subjects are able to experiment with different fractions before deciding upon a final

[56] See Figure 3.5 for an image of the income earnings task (all figures and tables for Part 4 are located in the appendix to Part 4).
[57] See Figure 3.6 for an image of the page used to report income.
[58] During the instructions, subjects are given the definitions of matched and non-matched and are told that a real world example of non-matched income is tip income.
[59] Subjects are not informed of the uses of this revenue, whether it go toward public good provision or otherwise. This omission is for simplicity since such an examination could add significant complexity to the experiment.

percentage to report with a calculator that is built into the software, which helps promote full information decision-making. Subjects may also view a history of previous rounds before making a decision. A virtual bingo cage determines whether subjects are audited. More specifically, audit is determined by the selection of a colored ball from a cage with 10 balls total. The number of colored balls represent audit while white balls represent no audit. The computer automatically deducts taxes paid and penalties (if any are owed) from subjects' accounts. Income for each round is represented by the following equation:

$$\text{After Tax Income} = G - t\,G\,[M*R_m + U*R_u] - A\,(t + P)\,G\,[M\,(1 - R_m) + D\,U\,(1 - R_u)], \text{ where}$$

- G = gross income,
- t = tax rate,
- M = percentage of income that is matched,
- R_m = percentage of matched income reported,
- U = percentage of income that is non-matched,
- R_u = percentage of non-matched income reported.
- A = 1 if individual is audited, 0 otherwise
- P = penalty rate on unreported income
- D = 1 if subject is detected upon not fully reporting non-matched income, 0 otherwise

Subjects are informed that they keep their after-tax earnings at the end of the experiment, converted from lab dollars to U.S. dollars at the rate of 100 to 1, and paid in cash. After income is reported and audit is determined, subjects see one final screen that summarizes everything that happened during that round.

The experimental design uses five combinations of matched versus non-matched income: 0 percent, 25 percent, 50 percent, 75 percent, and 100 percent non-matched and the corresponding matched percentages. These combinations should

provide for a broad understanding of the relationship between income matching policies and tax compliance behavior. There are three different tax rates: 20 percent, 35 percent, and 50 percent. The 50 percent tax rate closely represents an effective marginal tax rate for high-income individuals when considering top marginal personal income tax rates in combination with payroll taxes under the federal tax system in the United States. The study relies on a between group design for both of these variables. That is, these parameters are varied only between session and any particular subject only sees one combination of matched and non-matched income and one tax rate.

The probability of audit varies between 10 percent and 30 percent. These rates are much higher than actual audit rates in the United States. However, a more realistic audit rate, around two percent, would yield less meaningful results in this setting because so few audits would occur in each session. Indeed, many subjects would probably not be audited during an entire session.[60] The implications of this divergence from a more realistic setting are discussed below. The probability that an individual is detected evading taxes varies between matched and non-matched income. The probability of detection will be fixed at 100 percent for matched income for simplicity. Detection rates vary among 25 percent, 50 percent, and 75 percent for non-matched income. The penalty rate on unreported income is held constant at a rate of 50 percent.

At the beginning of each session, subjects participate in two practice rounds to ensure that they are comfortable with the situation and to allow them to ask clarifying

[60] Setting audit rates at these levels is a standard practice in the literature (see Alm, Jackson, and McKee (1992) for example).

questions before the actual rounds begin. Earnings per subject fall in the $19 - $37 (U.S. dollars) range based upon performance in the experiment, the tax parameters used in a particular session, and chance. The experimental design requires the administration of nine sessions as outlined in Table 3.1. Sessions consist of either 16, 14, or 12 subjects each based on subject availability.[61] Each session involves two stages, each with 15 rounds. The audit rate is the only parameter that changes between the two stages. In total, this experiment used 124 subjects resulting in 3,720 observations.

The experimental platform consists of 16 notebook computers, a server machine, and software designed for this series of experimentation. Sessions were conducted on the University of Tennessee campus using undergraduate students recruited randomly from various classes. Subjects were not allowed to participate in more than one session and had no prior experience in this series of experimentation. Methods adhere to all guidelines concerning the ethical treatment of human subjects.

3.D Behavioral Hypotheses

The experimental setting described above allows for an examination of five behavioral hypotheses. They are as follows:

H1: *Individuals are more likely to evade taxes when a larger share of their income is of the type that is not perfectly detectable by the tax authority*.

H2: *Higher tax rates lead to lower levels of tax compliance*.

H3: *Higher audit rates lead to higher levels of tax compliance*.

[61] Subjects are divided into two groups based upon the structure of Alm, Jackson, and McKee (2004). This division is maintained in this study to make for a better parallel to the previous study even though it is not required. The grouping is due to the information-sharing component in the earlier paper.

H4: *Higher wealth leads to lower levels of tax compliance.*

H5: *An audit in the previous round leads to higher levels of tax compliance in a subsequent round*.

Primary Hypothesis. The first hypothesis is the focal point of this study. No other studies have been identified that address this issue using experimental methods. The detectability of income doubtless affects the expected value of compliance versus evasion and, accordingly, would affect compliance in a rational tax evasion model. However, this issue remains an empirical question for several reasons. The first is, as with numerous experiments, individuals may not act in accordance with a rational tax evasion model. Second, these experimental results will provide information as to the relative magnitude of the effects of various parameters on tax compliance behavior. Third, in a controlled experimental environment, the exact probability at which certain income types are detected can be analyzed. If it is determined that less than perfectly detectable income increases tax evasion, an examination of the specific probability of detection provides valuable information that can be used in determining the merits of designing policies to increase the likelihood that certain income types could be detected upon audit.

Other Hypotheses. The remaining hypotheses have been examined before in the literature. However, a reexamination, while done mainly to complement the matched/non-matched income component of the study, is beneficial in and of itself for a two reasons. First, is that many of the earlier studies used only small sample sizes and replication enhances the reliability of these studies. Second, the overall

experimental design will be validated to some degree if results here match those of earlier studies.

The second hypothesis, that evasion increases with higher tax rates, contributes to the rather large literature on the topic in which theoretical predictions are ambiguous and empirical assessments are difficult to obtain.[62] Similarly, audit rates certainly change the expected value of reporting income versus not reporting and would likely affect tax compliance.

Wealth may affect tax compliance by affecting the marginal utility of another dollar of income and, correspondingly, one's risk preferences. Audits in the previous round would not affect compliance in a rational evasion model because the current round is independent of any previous rounds.[63] However, individuals may still respond to past audits because of (a) the "gambler's fallacy" or (b) the notion of "catching up." The gambler's fallacy means that individuals may incorrectly believe that an audit in the last round means that an audit in the current round is less likely. Catching up means that, if an individual were audited in the previous round, he or she may increase evasion to earn more income to make up for the penalty paid earlier.

Expected Value of Compliance versus Non-compliance. An important consideration is the expected value of reporting income versus not reporting. Table 3.2 reports the difference in the expected value of reporting 100 dollars of income versus not reporting any income for matched and non-matched income for each tax rate, audit rate, and non-matched income detection probability combination used in

[62] See Andreoni, Erard and Feinstein (1998) for a discussion of this result.
[63] This convention of round independence departs somewhat from actual policy since an audit can increase one's probability of future audit if an individual is found to be noncompliant.

this study. If individuals followed simple mathematical models perfectly and were risk neutral, these expected value calculations would predict behavior without error, and an experimental test would be unnecessary. However, individuals are probably not perfectly risk neutral and also may not follow a simple model of income maximization. In part, this study tests the perceptions of individuals. The individuals may have other reasons to comply or not, such as a moral values associated with compliance or "cheating." They also may focus on certain parameters more than others simply due to their priors derived from the media or other sources. For example, an individual may overweight the tax rate simply because he or she is familiar with it from prior experience.

Aside from these reasons, the expected value is still important because a simple rational tax evasion model likely explains a significant portion of individual behavior. The parameters are structured such that, for a risk neutral individual, it is rational to evade in most cases. Thus, the difference between the expected value of compliance and the expected value of non-compliance is negative in all but one case – with a low tax rate and a high audit rate on matched income. The design leans on the negative side because it is assumed that most individuals are risk neutral. Evading non-matched income always carries a larger expected gain relative to matched income, all else equal.

3.E Analytical Design

The primary component of this study consists of a generalized least squares regression model that explains income tax compliance as a function of several tax

variables and gross income. The model includes subject-specific effects to control for individual-specific characteristics. This model allows for heteroskedasticity across individuals. Income tax compliance is measured as the percentage of total income reported to the tax authority. The baseline model is summarized as follows:

$$\begin{aligned}\text{Percent of Gross Income Reported}_{i,t} = {} & \beta_0 + \beta_1 \text{ Gross Income}_{i,t} + \\ & \beta_2 \text{ Percent Non-Matched}_{i,t} + \beta_3 \text{ Tax Rate}_{i,t} + \beta_4 \text{ Audit Rate}_{i,t} + \\ & \beta_5 \text{ Probability of Detection}_{i,t} + \varepsilon_{it},\end{aligned}$$

where i and t are individual and round indices, and $\varepsilon_{it} = u_i + w_{it}$. The traditional error term is denoted by w_{it} and is assumed to meet all of the usual requirements. The individual-specific effect is denoted by u_i and controls for individual level heterogeneity.[64]

3.F Results and Discussion

This section begins with a review of several sets of cross tabulations to gain a general understanding of tax compliance behavior overall and as a function of various parameters. Presented second are results from a series of generalized least squares regression models that more precisely identify the relationship between tax compliance and the variables of interest.

Descriptive Statistics

The following is a summary of the overall tax compliance rate and compliance rates for matched and non-matched income separately:

[64] Controls to denote the round were included in a preliminary version, but they were not statistically significant determinants of compliance rates and were not included in the final analysis.

Income Type	Compliance Rate
Overall	47.6 percent
Matched income	54.2 percent
Non-matched income	41.4 percent

Results indicate that individuals report a much lower percentage of their non-matched income relative to matched income, providing evidence in support of the primary hypothesis.

Figure 3.1 presents the distribution of average tax compliance rates for individuals, over 30 rounds, for matched and non-matched income. Average compliance rates are grouped into five ranges, 0-20 percent, 21-40 percent, and so on. Here, as always, tax compliance is measured as the percentage of a subject's gross income that he or she reports. Most individuals posted average compliance rates at the extremes, close to either 100 percent compliance or zero compliance. This dichotomy is expected if risk preferences do not change over the income range of this study. Regarding compliance patterns for matched and non-matched income, a fairly strong picture emerges from this figure. Specifically, a noticeably larger portion of the non-matched sample falls into the 0-20 average compliance rate range while a larger percentage of the matched sample falls into the 81-100 range. Indeed, 49.9 percent of subjects exhibited compliance rates that fall into the 81-100 percent range on their matched income while only 32.8 percent of individuals exhibited compliance rates this high for their non-matched income.

Figure 3.2 presents overall compliance rates by the percentage of income that is non-matched, which alludes to the primary hypothesis that compliance decreases as more of an individual's income is non-matched. These simple results fail to provide

evidence that a strong relationship between non-matched income share and tax compliance behavior exists. These descriptive statistics indicate that compliance rates are similar when subjects' non-matched income share is zero percent and 25 percent. However, overall compliance rises slightly when income is evenly divided between matched and non-matched and then falls significantly as subjects receive 75 percent non-matched income before rising slightly again with 100 percent non-matched income. Of course, these simple statistics do not control for other factors that may influence tax compliance behavior.

Figure 3.3 continues this strand of analysis by presenting average tax compliance rates by the tax rate. As previously stated, it is theoretically unclear how compliance should respond to the tax rate. Here, results indicate that tax compliance decreases with higher tax rates, contrary to the hypothesis above. However, the drop is much larger moving between the 20 and 35 percent rate than between the 35 and 50 percent rate. Figure 3.4 presents compliance rates by income. While compliance increases between 60 and 70 lab dollars of income, average compliance rates decline fairly steadily as income rises above 70 lab dollars.

Regression Analysis

Results from several generalized least squares regression models are presented in Table 3.3. As previously stated, this mode of analysis allows for a more precise understanding of the relationships between the variables of interest. In this framework, coefficient estimates isolate the effects of the tax variables on compliance from every other factor included in the model, including subject-specific effects.

Controlling for subject-specific effects is especially important because this contrast isolates external factors that could blur the results, such as animosity toward the tax system, fairness, moral obligations to pay taxes, etc., and allows for a precise examination of the effect of changes in the included variables.

Baseline Model. Results from the baseline model are presented in the first column of Table 3.3, Model 1. Results support the primary hypothesis that tax evasion increases as individuals earn larger shares of non-matched income. Estimates indicate that tax compliance rates decline by 1.6 percentage points as the non-matched share increases by 25 percentage points. Relative to an average tax compliance rate of 47.6 percent, this indicates a fairly small elasticity. As previously stated, the probability that an individual's non-matched income is detected upon audit is also varied.[65] As expected, results indicate that a higher audit success rate leads to higher rates of tax compliance. More specifically, estimates indicate that tax compliance rates increase by 3.8 percentage points following an increase in the probability of detection of 25 percentage points.

Several of the other variables included in this regression are deserving of attention. Results indicate that higher income is associated with significantly lower levels of tax compliance. More specifically, an increase from 90 to 100 lab dollars would lower the percentage of income reported by 6.6 percentage points. In addition, results indicate that the tax rate is a statistically significant determinant of compliance. According to this model, a rate increase from 35 percent to 50 percent

[65] Recall that the probability of detection upon audit for matched income is fixed at 100 percent.

would lower compliance by 11.6 percentage points, a large change when considering average compliance rates. Results also indicate that higher audit rates lead to significantly higher rates of compliance. More specifically, increasing the audit probability from 10 to 30 percent would increase compliance by 4.9 percentage points, all else equal. The tax rate and audit rate results are consistent with the earlier findings of Alm, Jackson, and McKee (1992).

Robustness Checks. The second column of Table 3.3 presents a similar model with the inclusion of a dummy variable to denote whether an individual prepares his or her own tax return. These individuals may exhibit differing compliance behavior because they understand the tax system better due to their experiences with taxes. Alternatively, since most of the subjects are college students, many of those who have not filed their own tax return may simply have never been employed. Among those who have filed their own return, many may have worked as servers at restaurants and earned a significant portion of their income as tips. Furthermore, the convention in many restaurants may be that individuals do not report a large portion of their tip income. Therefore, the individuals who have filed their own return may have simply grown accustomed to evasion. Results indicate that individuals who do prepare their own return are much less likely to fully comply. Estimates show that income reporting rates are 20.7 percentage points lower for individuals who file their own tax return relative to those who do not. Other results from this model are largely unchanged.[66]

[66] Another potential explanation for the finding relating to whether an individual prepares his or her own taxes could be that this variable is simply picking up age, i.e., perhaps older people are more likely to prepare their own taxes, and they may have differing tax compliance patterns. However, a

Model 3 of Table 3.3 modifies the baseline by adding subjects' total earnings up to a given point in the experiment (wealth). Here, individuals may attempt to enhance their earnings if they have performed poorly in previous rounds, resulting in a negative relationship between wealth and non-compliance. Alternatively, wealthier individuals could have different risk preferences or they may be better able to afford gambling. Results indicate that higher wealth is associated with less tax compliance behavior. The last robustness check, Model 4, involves the inclusion of a variable to denote whether an individual was audited in the previous round. As would be predicted in a rational tax evasion model, an audit in the previous round is not a statistically significant determinant of compliance.

3.G Conclusions

In this study, an experiment is designed to test the effect of income that cannot be detected with certainty by the tax authority on tax compliance behavior. The results shed light on the issue of why the self-employed exhibit different tax compliance patterns relative to those in wage and salary employment if self-employment is often difficult to detect. They also provide evidence that can inform policy debate surrounding the design of optimal audit mechanisms and other tax policies. Experimental methods provide several advantages in examining this issue. Most of all, an appropriately designed experiment allows for a better isolation of the fundamental influences of income detection rates on compliance. In addition,

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model with age included (not reported) did not identify a statistically significant relationship between age and tax compliance behavior.

accurate tax compliance data are difficult to obtain in the naturally occurring environment because many individuals intentionally attempt to hide evasion.

Results indicate that individuals who earn a larger share of income that is difficult to detect exhibit significantly lower rates of tax compliance. In addition, results indicate that compliance increases when income that is not perfectly detectable carries higher rates of detection. In addition, results here can only be attributable to cheating since all relevant information in provided to the subjects. Other results confirm the findings of earlier studies with the finding that lower tax rates and higher audit rates lead to significantly higher tax compliance rates. Furthermore, this experiment suggests that individuals who prepare their own tax returns and wealthier individuals tend to evade significantly more.

The question is still not completely resolved as to why the self-employed (whose income is presumably more difficult to detect) exhibit differing rates of compliance relative to those who are in wage and salary employment. This research provides evidence that one reason for higher rates of non-compliance among this group is lower rates of detection associated with their income. However, other reasons may lead to the overall level of non-compliance among the self-employed, such as the lack of income withholding for this group. Also, they simply may make more mistakes because their tax returns are usually more complicated than those of individuals who earn wage and salary income. More research is required to verify the effects of these other factors and to measure their magnitude.

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Appendix

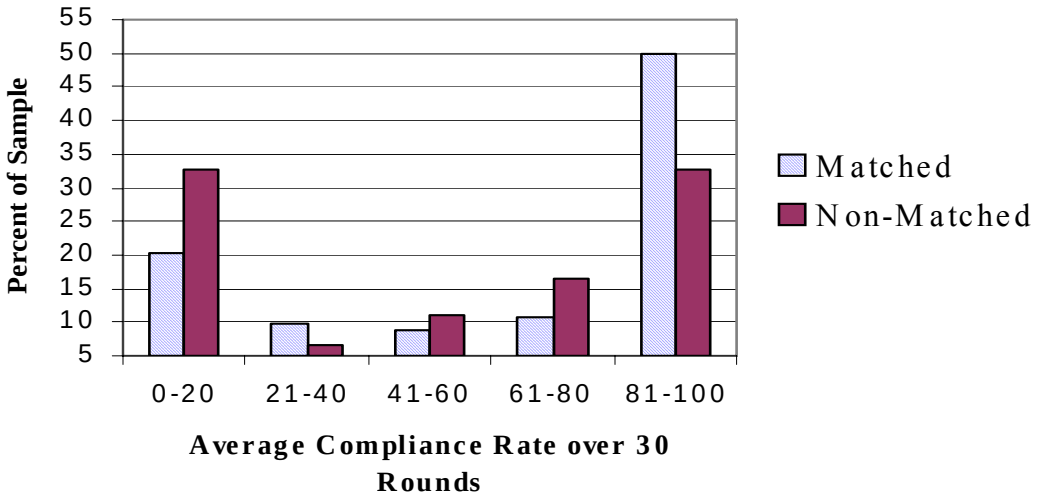

Figure 3.1: Distribution of Average Compliance Rates

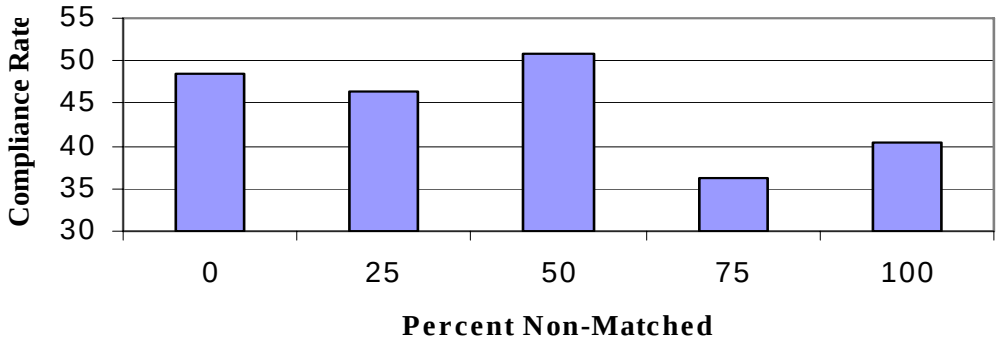

Figure 3.2: Compliance Rates by Non-Matched Share

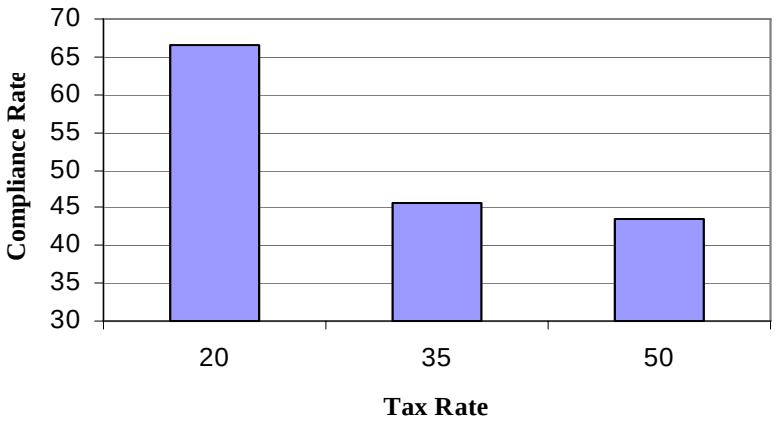

Figure 3.3: Compliance Rate by Tax Rate

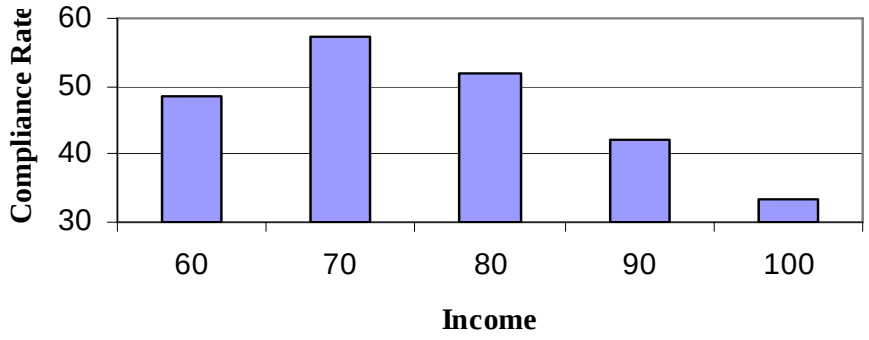

Figure 3.4: Compliance Rate by Income

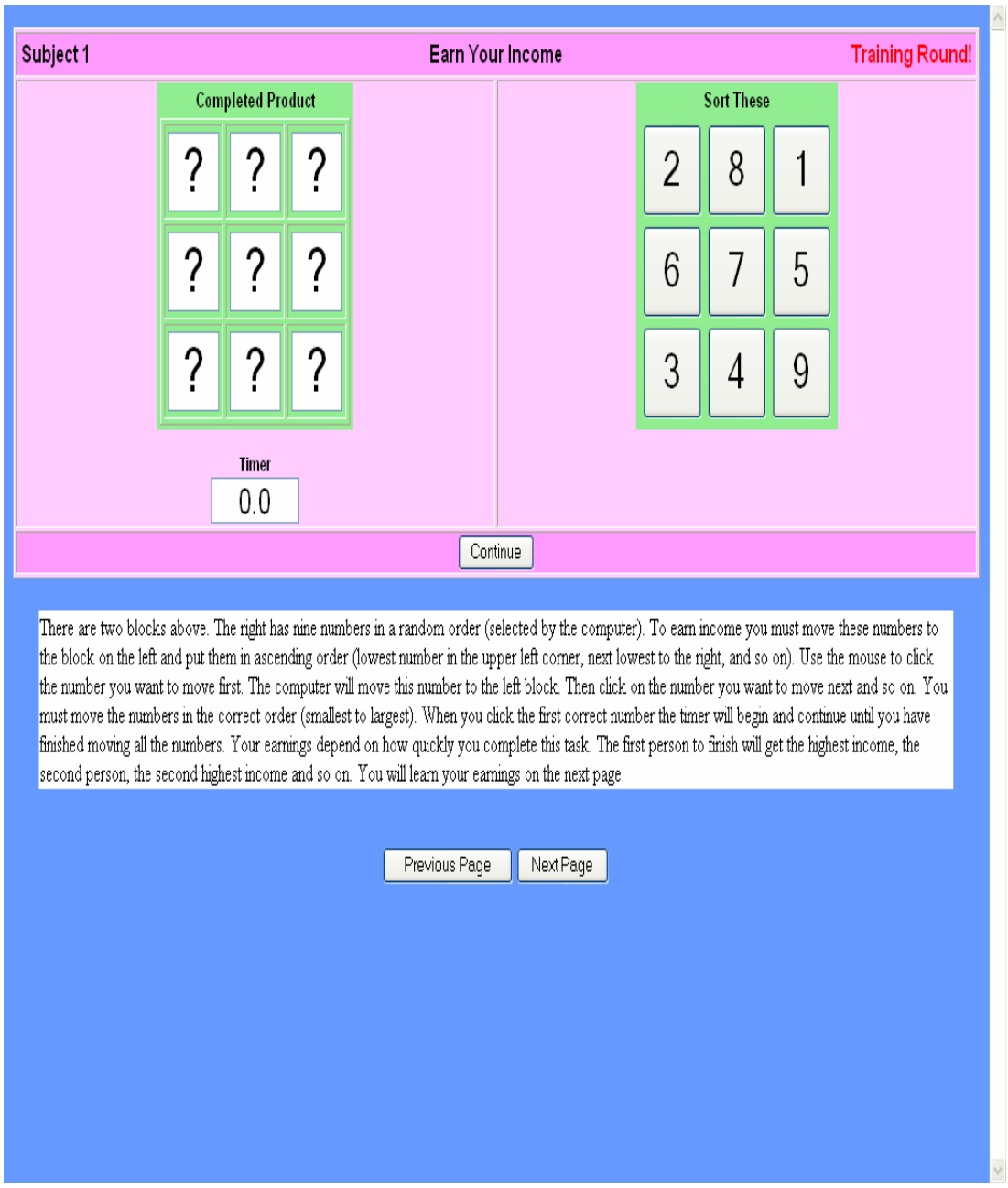

Figure 3.5: Earnings Task Image

Figure 3.6: Tax Form Image

Table 3.1: Experimental Design

Treatment	Percent Non-Matched	Tax Rate	Audit Probability	Probability of Detection
1	0	35	10 and 30	-
2	25	35	10 and 30	50
3	50	35	10 and 30	50
4	75	35	10 and 30	50
5	50	35	10 and 30	75
6	50	35	10 and 30	25
7	50	20	10 and 30	50
8	50	50	10 and 30	50
9	100	35	10 and 30	50

Table 3.2: Should a Risk Neutral Individual Comply?

Matched Income

Tax Rate	Audit Rate	Expected Value of Compliance - Expected Value of Non-Compliance
35	10	-26.5
20	10	-13.0
50	10	-40.0
35	30	-9.5
20	30	1.0
50	30	-20.0

Non-Matched Income

Tax Rate	Probability of Detection	Audit Rate	Expected Value of Compliance - Expected Value of Non-Compliance
35	50	10	-28.2
35	75	10	-29.8
35	25	10	-26.6
20	50	10	-14.0
50	50	10	-42.5
35	50	30	-14.7
35	75	30	-19.5
35	25	30	-9.8
20	50	30	-1.9
50	50	30	-27.4

These figures are based upon an income of 100 lab dollars and a penalty rate of 50 percent of unreported income.

Table 3.3: Generalized Least Squares Regression Results

	Dependent Variable: Percent of Total Income Reported			
Variable	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Percent Non-Matched	-0.062**	-0.054**	0.021	-0.053*
	(0.027)	(0.026)	(0.026)	(0.027)
Audit Success Rate	0.150***	0.104*	0.106*	0.163***
	(0.057)	(0.056)	(0.055)	(0.058)
Gross Income	-0.660***	-0.693***	-0.482***	-0.677***
	(0.065)	(0.064)	(0.064)	(0.067)
Tax Rate	-0.776***	-1.023***	-0.882***	-0.782***
	(0.098)	(0.098)	(0.095)	(0.100)
Audit Probability	0.245***	0.245***	2.087***	0.289***
	(0.070)	(0.068)	(0.126)	(0.074)
Prepare Taxes	-	-20.744***	-	-
	-	(1.524)	-	-
Wealth	-	-	-0.034***	-
	-	-	(0.002)	-
Audit Last Round	-	-	-	-1.645
	-	-	-	(1.865)
Constant	119.88***	139.43***	108.93***	119.48***
	(7.35)	(7.31)	(7.09)	(7.49)

Entries are generalized least squares panel regression coefficients with standard errors in parentheses.

*, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

All percentages are on a 0-100 scale.

There are 3,720 observations for models 1, 2, and 3, utilizing 124 subjects.

Model 4 utilizes 3,580 observations, also with 124 subjects. Here the first round was dropped for the lagged audit variable.

Vita

John Allen Deskins was born in Lynchburg, Virginia on May 23, 1978. John began his studies at Swords Creek Elementary School. He progressed to Honaker High School and, in June of 1996, received his diploma. After high school, John continued his academic pursuits at Emory & Henry College where he was awarded the B.A. and B.S. degrees with majors in economics and management in May of 2000. John then entered the Graduate School at the University of Tennessee where, in August of 2003, he received the M.A. degree in economics. John accepted an offer to join the Economics Faculty at Creighton University in Omaha, Nebraska after completing his Ph.D.